

EXPLORING THE POSSIBILITY OF TAKING AN ECOSYSTEMS APPROACH TO SPATIAL PLANNING AT LOCAL GOVERNMENT LEVEL

by
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Declaration

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ABSTRACT

With 60% of the world's ecosystems degraded and under increasing pressure from land use changes, it has become essential to better manage the connections between development and ecosystems protection

These ecosystems (directly and indirectly) provide the entirety of the human race with ecosystem services free of charge, with the estimated benefits that ecosystems provide humans calculated at approximately \$125-\$145 trillion a year. Through rapid land use changes and over exploitation, these benefits are decreasing rapidly. In order to better manage land use changes and ensure that this is done in a way that optimises development without compromising the provision of ecosystem services, a stronger focus needs to be placed on ecosystems within land use and spatial planning practices.

In the South African context local municipalities are the mandated parties responsible for land use planning, management and development. For stronger consideration of ecosystems and the services they provide people, local municipalities have thus been pinpointed as a key component of the governance system for intervention. As is frequently the case with regard to municipalities in rural South Africa, these ecosystem services provide a safety net without which poor rural communities would battle to make ends meet. Through a case study of Maruleng Local Municipality, this thesis will explore the possibility of the municipality playing an increased role in protecting ecosystems and the services they provide through their spatial land use planning systems by analysing the legislative and contextual structure of the municipality, underpinned by a socio-ecological systems framework.

OPSOMMING

Met 60% van die wêreld se ekosisteme onder toenemende druk as gevolg van die onvolhoubare ontwikkeling van grond, het die tyd aangebreek vir beter integrasie van ekosisteembestuur en ontwikkelingsbeplanning. Hierdie ekosisteme, wat toenemend gedegradeer word, verskaf (op direkte en indirekte wyse) aan die mensdom gratis ekosisteemdienste en -voordele tot en met 'n waarde van tussen \$125 en \$145 triljoen per jaar. Uitbuiting en onvolhoubare verbruik van hierdie ekosisteemdienste veroorsaak 'n afwaartse kurwe in hulle beskikbaarheid. Ten einde verandering van grondgebruik meer doeltreffend te bestuur en te verseker dat dit op so 'n wyse gedoen word dat ontwikkeling geoptimeer word – sonder om die integriteit van ekosisteme en hulle vermoë om dienste te lewer negatief te beïnvloed – moet groter fokus geplaas word op grond-en ruimtelike beplanningspraktyke. Om sulke tipe ontwikkelingspatrone te handhaaf, behoort 'n sterker ekosisteembenadering nagevolg te word wat betref grondgebruik en ruimtelike beplanningspraktyke.

In die Suid-Afrikaanse konteks lê die mandaat vir ontwikkelings- en grondgebruiksbeplanning by plaaslike munisipaliteite. Vir die doel van die ontwikkeling van 'n meer doeltreffende ekosisteembenadering binne ontwikkelings- en grondgebruiksbeplanning, is plaaslike munisipaliteite dus 'n belangrike intervensiepunt. Hierdie tesis sal die moontlikheid verken dat plaaslike owerhede 'n groter rol speel in die beskerming van ekosisteme en die dienste wat hulle verskaf deur middel van hul ruimtelike landgebruikbeplanningstelsels omdat – soos dit dikwels die geval is met landelike munisipaliteite in Suid-Afrika – hierdie dienste as veiligheidsnet dien vir arm gemeenskappe wat sterk steun op dié dienste om hulle lewensbestaan te onderskraag. Hierdie tesis verken die moontlikheid van 'n ekosisteembenadering tot grongebruikbeplanningstelsels binne die konteks van die landelike Maruleng Plaaslike Munisipaliteit deur middel van 'n analise van die wetgewende en konteksuele strukture waaronder die munisipaliteit funksioneer.

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LIST OF ACRONYMS AND ABBREVIATIONS

AM	Adaptive Management
AWARD	Association for Water and Rural Development
B-GIS	Biodiversity Geographic Information Systems
BRP	Bioregional Plan
CAS	Complex Adaptive Systems
CBA	Critical Biodiversity Areas
CT	Complexity Thinking
DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
ES	Ecosystem Services
GIS	Geographic Information Systems
GVA	Gross Value Added
HWB	Human wellbeing
IDP	Integrated Development Plan
K2C	Kruger to Canyons Biosphere
LCPv2	Limpopo Conservation Plan version 2 2013
LEDET	Limpopo Economic Development; Environment and Tourism Department
LEGDF	Limpopo Employment, Growth and Development Plan
LED	Local Economic Development
LEMA	Limpopo Environmental Management Act 2003
LGEP	Limpopo Green Economy Plan
LPLGLRA	Limpopo Province Local Government Laws Rationalisation Act 2000
LSPLUMB	Limpopo Spatial and Land Use Management Bill (2012)
LM	Local Municipalities
LUMS	Land Use Management Scheme
MA	Millennium Assessment
MEC	Member of the Executive Council
MLM	Maruleng Local Municipality
MSA	Municipal Systems Act 2000
NBSA	National Biodiversity Spatial Assessment 2011

NDP	National Development Plan 2030
NEMA	National Environmental Management Act 1998
NEMBA	National Environmental Management: Biodiversity Act 2004
NEMPAA	National Environmental Management: Protected Areas Act 2003
NFEPA	National Freshwater Ecosystems Priority Areas
NGO	Non-Government Organisation
NR	Natural Resources
NSDP	National Spatial Development Perspective
NSSD	National Strategy for Sustainable Development 2011
NWA	National Water Act 1998
OLEMF	Olifants Letaba Environmental Management Framework 2009
PES	Present Ecological State
PA	Protected Area
PM	Post Modernism
RESILIM O	Resilience in the Limpopo Basin: Olifants Catchment
SALGA	South African Local Government Association
SANBI	South African National Biodiversity Institute
SA	South Africa
SCP	Systematic Conservation Plan
SDF	Spatial Development Framework
SD	Sustainable Development
SEA	Strategic Environmental Assessment
SES	Socio-ecological Systems
SPLUMA	Spatial Planning and Land Use Management Act 2013
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VSTEPP	Values; Social; Technology; Environmental; Economic and Political

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CHAPTER 01: INTRODUCTION

1.1 INTRODUCTION

There is growing concern about the ability of humans to protect biodiversity and ecosystems. Traditional beliefs entail the notion that development takes place at the cost of the environment, or that vice versa, protection of biodiversity and ecosystems happens at the cost of development (Wittmer and Gundimeda, 2010). With growing human populations and humans living increasingly more consumptive lifestyles, massive strain is being put on ecosystems. The growing lack of sentience of human centric development and the dependency of its success on healthy ecosystems and the services they provide, have caused unsustainable natural resource usage patterns to emerge. This scenario has emerged due to infinite development models being applied to a planet with finite natural resources. The current development paradigm rarely focuses on optimisation and effective sustainable management of natural resources (Geneletti, 2011). This study will explore the possibilities for doing this within the context of a rural landscape in South Africa, focusing on a local municipality as key intervention point. The focus will be placed on using spatial land use planning as a mechanism with which to ensure that ecosystems are managed better in order to ensure that they become more resilient to negative drivers such as increasing human development footprints. The approach incorporates the complex system of nuances of the municipality, and in doing so adds a human centric approach to improved ecosystems management.

1.2 PROBLEM STATEMENT

Since the demise of Apartheid South Africa has adopted a developmental state approach for addressing inequalities. The government's approach directly relates development to service provision, improved infrastructure development and job creation, as captured in the National Development Plan (NDP) 2030 (NPC, 2011). The aggressive pursuit of government to achieve equality and improve the well-being of its citizens has led to a scenario where the ecosystems that provide the services of which development is dependent, has become neglected in various ways. South Africa has good general environmental legislation, but at the implementation level it is often disregarded in favour of development endeavours. Another challenge faced in the South African context is that developmental and environmental government entities often work in silos (Mhlanga, 2014).

Local municipal level is seen as the interface space where environmental and development related planning can be married, as it is mandated to work at local implementation level. Currently some marrying of these focus areas does occur, but not in a systemic way, as there is often a lack of

understanding of how dependant improving the well-being of people are on healthy ecosystems and the services they provide. For ecosystems to thrive they need to be better managed at larger landscape level where the linkages between them and the services they provide to people can be better understood (Pollard *et al.*, 2014). This understanding then needs to be ingrained into development planning systems in order to sustainably optimise development that ensures ecosystems are not destroyed but are managed effectively in order to help government ensure the sustainable and improved well-being of its people. This is currently not happening, and spatial land use planning is seen as a key tool with which to launch such an ecosystems focused approach to development.

1.3 RESEARCH OBJECTIVE AND QUESTIONS

The research objectives and their related sub-questions can be divided into two sections:

- Creation of a detailed understanding of the subject of ecosystems and spatial land use planning within a complex socio-ecological system.
- Exploration of the ability to incorporate ecosystems approaches in spatial land use planning, and its feasibility within the specific context of Maruleng Municipality.

The first section of this study (sub-question 1-3) provides an overview of several departure points central to answering the Overarching Research Question. The first section is then analysed in order to inform a discussion that aims to address the Overarching Research Question in the second section (sub-questions 4 and 5). Below is a flow diagram showing the approach taken in order to answer the Overarching Research Question.

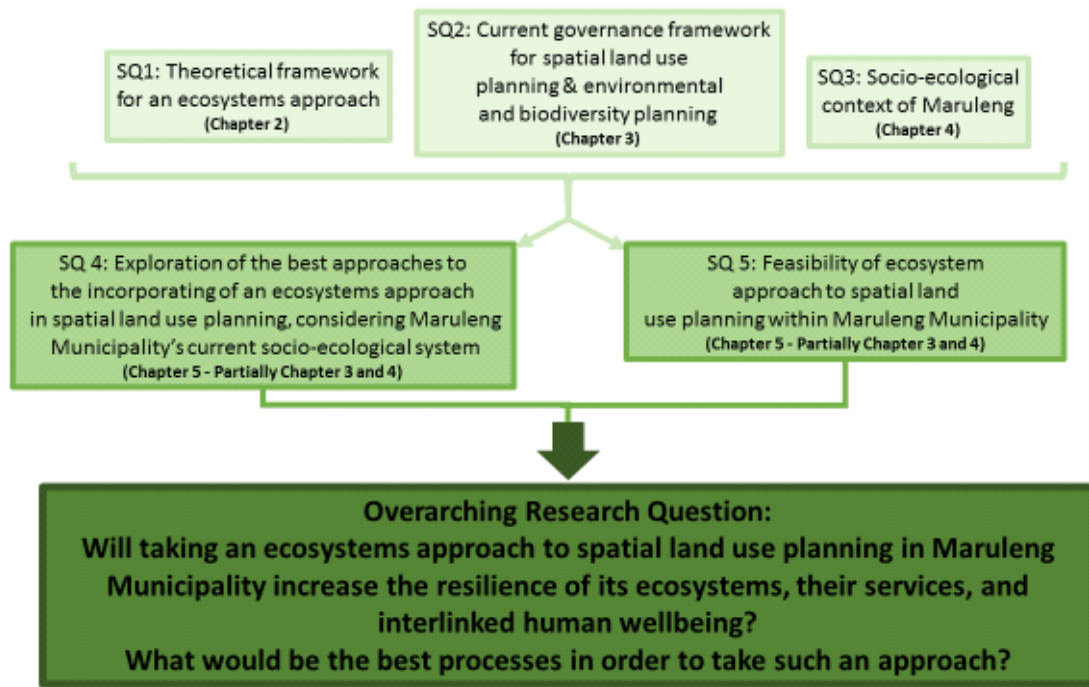


Figure 1.1: Research Layout

Overarching research question:

Will taking an ecosystems approach to spatial land use planning in Maruleng Municipality increase the resilience of its ecosystems, services, and interlinked human well-being and if so, what would be the best process for taking such an approach?

Sub-question 1:

How does one conceptualise the creation of a framework for better ecosystems and development integration, specifically using the spatial land use planning at local municipality level as focal point? Aims are to create a better understanding of the following:

- Conceptualising what a theoretical framework would look like for taking an ecosystems approach to spatial land use planning at local municipal level.
- Conceptualising what angles, or framings, exist that would help systemically link ecosystems and human development trends.
- Creating an understanding of what would be the best management tool to apply the abovementioned framework and angle.

Sub-question 2:

Is there a place for an ecosystems approach to spatial planning within the existing formal governance system around the broader environmental and spatial land use planning framework?

Aims are to create a better understanding of the following:

- What the current legislative and implementation environment is in which spatial land use planning, biodiversity and environmental planning occurs in South Africa.
- If current environmental and biodiversity planning tools be used at various government spheres as vessels for the incorporation of ecosystems approaches at local municipal spatial land use planning processes.

Sub-question 3:

What does the current socio-ecological system look like in Maruleng Municipality?

Aims are to create a better understanding of the following:

- What drivers exist within the Maruleng Municipality related to values, the development status of the municipal area and what does the current socio-economic and political environment look like in the Maruleng Municipality.
- What the current status is of ecosystem service provision and usage within Maruleng Municipality.
- What the linkages are between ecosystems, their services and the state of human well-being in Maruleng Municipality.

Sub-question 4:

What would be the best approach to incorporating an ecosystems approach into the spatial land use planning systems in Maruleng Municipality?

Aims are to create a better understanding of the following:

- If it is feasible to try and incorporate an ecosystems approach into spatial land use planning using the legislative framework.
- If the link between ecosystem services and human well-being can be used as an incentive to move to a stronger ecosystems approach in spatial land use planning within the context of Maruleng Municipality.

Sub-question 5:

What is the feasibility of an ecosystem approach to spatial land use planning within Maruleng Municipality and what would the recommendations be for taking an ecosystems approach to spatial land use planning?

Aims are to create a better understanding of the following:

- What the case study explored in this thesis can teach us about the socio-ecological system and the governance structures in place to manage it.
- What could be possible further interventions in an instance where an ecosystems approach was to be pursued at local municipal level when doing spatial land use planning?

1.4 RESEARCH DESIGN AND METHODOLOGY

In order to address the research questions above and achieve the desired outcomes, various research methodologies needed to be followed. The design of the research was framed in order to ensure that the research questions were addressed in the best holistic and systemic way possible. Currently existing methods were used as frequently as possible, these included interviews, sitting in on meetings, workshop attendances, a literature review and questionnaires (Mohd Noor, 2008). As further investigation of how to ascertain for certain how the socio-ecological system functions within the Maruleng area an exploratory new mapping method (within the South African local municipality context) was used to spatially represent ecosystems services' supply and demand. The research period was from 2014-2016, particularly focusing on the transition phase local municipalities were going through in the advent of the adoption of the Spatial Planning and Land Use Management (hereafter referred to as SPLUMA) (Act 16 of 2013) (RSA, 2013). The timeline was also aligned with the local municipal election period in order to prevent political variables from influencing results. Below is a breakdown of the methods and the processes that followed:

1.4.1 Literature review

The literature review was the predominant method used to inform this research. It was used to create a theoretical framework for the application of an ecosystems approach and as the main method with which to ground the approach using the current existing spatial land use planning, as well as biodiversity and environmental, legislation and frameworks spanning from national to local government level. Moreover, It was utilised to help understand the context of Maruleng Municipality in combination with the ecosystems mapping process, under the VSTEOP (values; social; technological; environmental; economic and political) methodology (see below).

VSTEEP methodology

Overview

Chapter 4 focusing, on the current socio-ecological state of Maruleng Municipality, was done using a method called the V-STEER. It is simply an acronym for the following:

- V – Values
- S – Social
- T – Technological
- E – Environmental
- E – Economical
- P – Politico-legal

Each letter of the acronym refers to categories of drivers influencing the focus area. It aims to construct an explicit and complete picture to ensure that a systemic understanding of the area is produced. For instance, Value drivers focused on democracy, efficiency, transparency, family or group cohesion; Economic drivers may include economic incentives for development and Gross Domestic Product drivers in an area. Some drivers overlap, and cannot be placed in one single category, but the main point of this overview method is not to achieve this, but simply to create a better trans-disciplinary, holistic and systemic understanding of the area and its drivers through stakeholder engagement and a literature review to help understand the abovementioned examples of drivers (Pollard *et al.*, 2014). Understanding these drivers is important if one is to understand how to promote a more resilient spatial land use planning system that will help achieve desired outcomes (which in this case is a stronger ecosystem focus).

Naming the characteristics, factors and drivers of a system is an important component of developing the systemic view of an area (Hansen and Pollard, 2014) – hence the reason why it was chosen as the desired criteria to apply for this research. VSTEER originated as a research tool to help better acknowledge the complexity of the components within a system, and also in order to help develop that systemic understanding and view. VSTEER was originally developed as STEER (Social; Technological; Environmental; Economic; Politico-legal), and with further iterations of the process the need to look at underlying value systems often driving the emergence of the STEER findings meant that a V (Values) was added. Up to this stage it was a tool developed and utilised mostly by SANParks to help guide decision-making around biodiversity conservation that included a more holistic internal and public understanding – in line with Adaptive Management principles.

1.4.2 Ecosystems services supply and demand mapping in chapter 4

In order to promote an ecosystems planning approach to spatial land use processes, a clear understanding needed to be created of the ecosystems supply and demand in the Maruleng area. In order to do the mapping activities from which to create an understanding of ecosystem supply, datasets were used – as created through various nationally driven projects such as the National Spatial Biodiversity Assessment of 2011 (Driver *et al.*, 2012) and the Limpopo Conservation Plan v2 of 2013 (LEDET, 2013)¹. The key layers used for the supply mapping were obtained from the already existing spatial datasets emanating from the abovementioned reports, using the SANBI GIS Portal² and manipulated to fit the needs for the Maruleng assessment using ArcGIS software (ArcMap 10.2 and ArcCatalog 10.1). The files used for these activities were either .kml files (Keyhole Markup Language) or shapefiles.

The demand for ecosystem services were mapped using Statistics South Africa³ Census 2011 data. The data were accessed as raw excel format datasheets from an online Statistics South Africa application called Superweb. This data was then processed in Excel and given spatial expression using a basic data manipulation model created in ArcMap 10.2. Similar to the abovementioned .kml, shapefiles and .xls files were utilised for the data manipulation process. A similar process was used for mapping some socio-economic data in Chapter 4 as well.

Doing these mapping activities allowed for a better understanding of the spatial picture of development, as well as of socio-economic, political and broad environmental factors playing a part in the landscape of Maruleng. It is considered to be one of the most important aspects of this research as it also piloted a very basic technique for mapping ecosystem service supply and demand within the context of a local municipality in a rural area also within the broader South African landscape.

1.4.3 Stakeholder engagement

The stakeholder engagement process took place in three main ways as listed and rationalised below. These extensive engagements were set up in order to ensure that an in depth understanding was created of the area and also of the way the spatial land use planning and the environmental planning were managed in the area, as well as helping with exploring to bring the two together using an ecosystems approach.

¹ By the time this thesis was finalised the Limpopo Conservation Plan was not yet updated whilst the National Biodiversity Assessment was planned to be launched in early October 2019 by SANBI and DEA.

² (www.bgis.sanbi.org)

³ (www.statssa.org)

1. Maruleng Municipality public participation meeting attendances

Attendance of public participation meetings at Maruleng Municipality was done as a scoping phase throughout a time period of 6 months to help create a thorough contextualisation of it as the cornerstone institute with which to work in order to ensure more effective integrated spatial land use planning occurs. It was also done to help ensure that a mutual relationship was created with the municipality, that would help to guarantee possible future collaboration as part of the work done in cooperation with AWARD (Association for Water and Rural Development) on the RESILIM O (Resilience in the Olifants Catchment) project. This was an important process because often when consultants or researchers come to local authorities (including traditional authorities), they do so with an all knowing attitude that very quickly deters the people they try to approach, particularly in the Lowveld area where much research occurs as mentioned by Uys (2014). Having this type of approach also means that these people one tries to engage with, clamp up and are less willing to share their time and information.

The following Public Participation Meetings were attended:

- 04 April 2014: Local Economic Development Strategy Review Process;
- 22 May 2014: IDP and Budget Public Participation Meeting;
- 06 August 2014: IDP Representative Forum Meeting;
- 21 August: SDF Forum – Review Phase 02 Meeting;
- 11 September 2014: Tourism Strategy Plan Meeting.

2. General meetings

14–16 April 2014: RESILIM-O Biodiversity three day meetings covering:

- Natural Resource Management and Ecosystem Services;
- Protected Area -Expansion; – Management and –Stewardship;
- Biodiversity Governance.

These meetings were held to help create a link between what is happening with regards to biodiversity management in the Olifants River Catchment and how that could be linked to the NGO sector in the Lowveld area. It was useful because it created a very good picture of where intervention is needed to improve biodiversity planning and management. Specific concern had been raised around how to improve environmental prominence within local level planning and management tools.

- 20 May 2014: Hoedspruit VSTEOP Meeting: Run by AWARD as a multiple stakeholder process. This was an open meeting which all were welcome to attend. There was a wide variety of

representatives from government, NGOs, agriculture, academia and ecology in attendance. Twenty-six people participated in the process, held in the main town of Maruleng Municipality, Hoedspruit. The meeting aimed to co-construct an understanding of the area with regards to broader natural resource management. Participants were requested to describe the characteristics and drivers of the social-ecological system (using the VSTEPP categories) for the Lowveld section of the Olifants Catchment (of which 77% covers Maruleng Municipality).

- 04 June 2014: General meeting with the K2C Biosphere chief executive officer, Miss Mari-Tinka Uys, because the K2C is seen as a key institution with regards to promoting improved environmental awareness and management, particularly around the Maruleng Municipality area.
- 24 July 2014: Discussion with Dr Stephen Holness on how to go about biodiversity planning, with specific focus on the spatial side of how it plays out and how to mainstream it into municipal spatial planning.
- 12 August 2014: Meeting with Mr Fred Mathey, owner of Laduma TAPP and experienced spatial and townplanner. This was done to help create an understanding of what problems planners face when developing SDFs for municipalities, and how they think it is possible to improve environmental inclusion into land use planning and decision-making support tools.
- 13 August 2014: Meeting with LEDET (Limpopo Economic Development, Environment and Tourism) representatives (Johan Kruger: Biodiversity Management Department and Rian Visagie: State Owned Protected Areas Management) to help understand their role as the provincial environmental department and to better understand their challenges with regard to improved environmental management and planning.
- 02 September 2014: Meeting with real estate agent (Miss Cristelle Stoop of Remax) to help form an idea of the number of wildlife estates within the Maruleng Municipality and their spatial footprint and socio-economic impact.
- 03 September 2014: Meeting with Modtilo Willide Estate Manager Mr Ernst Scheepers to help understand the role of wildlife estates within the land use mosaic of Maruleng Municipality.
- 05 September 2014: Meeting with Dr Wynand Uys to create an understanding of the spatial footprint and role of protected areas, private nature reserves and conservancies within the land use mosaic of Maruleng Municipality.
- 23 September 2014: Meeting between LEDET; Maruleng Municipality representatives; AWARD (NGO) and Stephen Holness (Biodiversity planning expert). This process was run to help create an understanding of the lack of feedback loops which exists between Maruleng as local

municipality and LEDET as provincial environmental department and to see how this can possibly be improved in the future.

- 25 August 2014: Meeting between Maruleng Municipality Spatial Planning and Economic Development (SPED) director, Miss K. Sithole, and AWARD to explore partnerships between the NGO and the municipality with regards to more integrated and environmentally focused spatial and development planning.

3. Questionnaires/Interviews

The interviews and questionnaires were done by spending time with people in the area to get to know how they see the area and what they value around ecosystems and how one could marry their inputs into spatial land use planning at the Maruleng Municipality level. The interview and questionnaire were designed as a complementary process aimed at collecting both quantitative and qualitative data. The questionnaire (see Appendix 1) and interview consisted of nine primary questions which were posed in a discussion format. The interviewer explained the question after which the interviewees stated their thoughts before writing them down. Six of the nine questions also had a rating (1–6) to provide a more explicit, quantitative understanding. Additionally, participants were asked to suggest forums, meetings or individuals that would be worthwhile to interact with, as well as what in their view could promote integration of ecosystems (and their services) into spatial land use planning. Participants from the area were also given a map as part of Question 5 on which, after orientation, they could, through a participative mapping process, illustrate what they consider to be key areas ecosystem service provision areas in the Maruleng Municipality.

Three interviews were sent out via e-mail and done telephonically with people who have better honed technical skills such as provincial environmental department managers and biodiversity planners. One interview (with the Environmental Monitors) was done in a larger group context, with the same procedure followed as in a one-on-one situation. The rest of the interviews were done in 1–1.5 hour one-on-one sessions. Below is a breakdown of the interviews done and from where the people were that were interviewed (local being people from Maruleng and non-local being people from outside Maruleng). An example of the questionnaire, including a participative mapping exercise, is attached in Appendix 1. Table 1.1 summarises all the interviewees.

Table 1.1: Research Methodology – Research Questionnaire Participants

Name	Insitution	Position	Overarching Sector	Locality
Dr S Holness	Consultant	AWARD Research Associate	Conservation Scientist	Non-local

Ms C Du Preez	Hlokomela Health and DA	Director and Ward Councillor	Local Representative	Local
Ms M Malepe	K2C	Biosocial Projects Implementer	Biosphere Representative	Local
Ms Beauty	K2C/SANParks	Environmental Monitor	Local Representative	Local
Ms Boledi	K2C/SANParks	Environmental Monitor	Local Representative	Local
Ms Getrude	K2C/SANParks	Environmental Monitor	Local Representative	Local
Ms Madibe	K2C/SANParks	Environmental Monitor	Local Representative	Local
Miss Masete	K2C/SANParks	Environmental Monitor	Local Representative	Local
Ms Matrice	K2C/SANParks	Environmental Monitor	Local Representative	Local
Ms Santengs	K2C/SANParks	Environmental Monitor	Local Representative	Local
Ms Sedana	K2C/SANParks	Environmental Monitor	Local Representative	Local
Ms Wilma	K2C/SANParks	Environmental Monitor	Local Representative	Local
Mr A Manoko	LEDET	Environmental Governance and Municipal Support Manager	Provincial Department Representative	Non-local
Mr J Kruger	LEDET	Biodiversity Management Manager	Provincial Department Representative	Non-local
Dr K Steenkamp	LEDET	Environmental Special Programmes Manager	Provincial Department Representative	Non-local
Ms M Rogers	LEDET	Deputy EIA Manager	Provincial Department Representative	Non-local
Ms P Maila	Maruleng LM	Secretary Spatial Planning and Economic Development	Local Municipality Representative	Local
Mr M Lotter	MTPA	Biodiversity Planner	Conservation Scientist	Non-local
Anonymous	Anonymous	Spatial Planner	District Municipality Representative	Non-local

1.5 LIMITATIONS OF THIS STUDY

- Using ecosystems and the services they provide as means of making clear the benefits a healthy environment provides, and therefore the need for a rationale to incorporate it to a larger extent into municipal planning processes, was always going to be difficult due to the lack of clear methodologies available to value ES (ecosystem services) because of its complex and subjective nature.
- A lack of academic work done on some of the approaches used in this thesis meant that no theoretically strong framework to help guide the thesis could be set up. Marrying many principles was attempted in this thesis and several of these have had very limited academic work done on them. The two primary examples are mentioned below:

- The Systems and Complexity approach and marrying it to spatial land use planning and management.
- Incorporating ecosystems and ES into governmental planning processes such as spatial land use planning has been done in a few case studies in developed countries, but nowhere in developing countries, such as South Africa, which has a very strong developmental focus.
- The current level of change occurring around spatial land use planning means that the findings of this thesis may be null and void in a few years. The Spatial Planning and Land Use Management (SPLUMA) (16 of 2013) (RSA, 2013) offered considerable direction by creating standards for local municipalities to adhere to. The necessary changes under SPLUMA need to be implemented five years from their enactment date, thus, the current spatial land use planning and management processes at local municipality level is likely to change within the next couple of years (RSA, 2013).
- The study focuses more on the ‘what’ and ‘why’ than on the ‘how’ of using an ecosystems approach to spatial land use planning due to time constraints. Regarding the ‘how’, some basic ecosystem service supply and usage were spatially represented in chapter 3, but to a limited extent due to data constraints. The ecosystems service usage and supply data were not specifically created in order to understand ecosystem services better, thus creating usable datasets from it were reduced to be able to combine and calculate likely usage and demand through combining various sources.
- There were no quantitatively ground truthed samples used for the desktop ecosystem service usage mapping process, although interviews gave qualitative correlation to what was found during the desktop mapping process.
- Setting up of interviews:
 - Due to limited resources not all the people that were lined up could be interviewed (i.e. people from parastatals such as SANBI, national departments such as DEA and more district- and local- municipality representatives).
 - The questionnaire aimed to cater for a broad audience of interviewees and consequently contained some generic questions that could have been more case specific.
- VSTEED limits: The Values section of the VSTEED were based primarily on the data collected during the Maruleng VSTEED meeting and interviews, no literature was located that could back up the values that emerged; hence the information is largely subjective and only contains the values pointed out by the people involved in the abovementioned meeting and interviews.

- This research only focused on the period of 2014-2016. This was the initial stage for the implementation of SPLUMA. Within the rural local municipality context of Maruleng, full implementation of the Act was not fully realised in this time period (RSA, 2013).

1.6 KEY CONCEPTS

Spatial land use planning

According to the Department of Rural Development and Land Reform (2011), land use planning is a planning tool that pursues order and regulation within land use systems in order to optimise development. It is normally done in a systematic way that incorporates social, economic and geographical conditions.

Spatial land use planning focuses on making the abovementioned processes spatially explicit through coordination of policies and practices influencing spatial prioritisation. This concept is traditionally only interested in development management through focusing on anthropogenic factors such as economic and social elements, especially in the current spatial land use planning systems in use by local municipalities within rural South African landscapes (Oranje and Merrifield, 2010).

Complex adaptive systems

Complex adaptive systems-thinking bases its principles on complexity and systems thinking. It argues that the systems we as humans try to manage are intricate and complex, thus cannot be seen as isolated, but rather being part of a myriad of drivers and influences (Hubler, 2007). Thinking of management as a linear process thus often creates gaps in planning and management processes (Dodder and Dare, 2000). The promotion of the realisation that all things are intricately linked is focused on as an angle to help drive home the idea that development cannot happen on its own tangent – it needs to be linked with coinciding ecological processes in order to achieve more resilient ecosystems that can sustainably produce ecosystem services.

Resilience

Holling (1973: 02) summarised it as follows: “resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb change of state variable, driving variables, and parameters, and still persist”. Resilience in the context of this thesis will be used to describe the ability of ecosystems to adapt to negative environmental, social, political and economic drivers putting their health under pressure. The aim is to increase the resilience of ecosystems to these factors through improved spatial land use planning, to eventually also help

maintain the human well-being of the population of Maruleng, who are directly dependant on these ecosystems and their services.

Biodiversity

All the genes, organisms, species and ecosystems and all the differences between them currently existing on the planet, contribute to the planet's biodiversity. The more abundant species and populations are within an area, the more biodiverse it is (Driver *et al.*, 2012).

Ecosystems

According to Mooney *et al.* (2004) an ecosystem comprises a community of organisms and their non-living environment, all interacting (through energy flows and nutrient cycles). The interactions amongst the components is what makes it an ecosystem; therefore, humans should not be seen as separate, but components whose actions and interactions have effects on the system.

Socio-ecological system

Socio-ecological systems are similar to the ecosystems prescribed above, with the distinct difference that they include social factors in the broader system. The interactions between the human and ecological factors are highlighted due to the often-substantial effect they have on the ecology. This type of conceptualisation emerged to help delineate the complex interactions of humans and the environment, as both exist within the same temporal and spatial footprint (Simonsen *et al.*, 2014). For the purpose of this thesis there will be specifically looked into the human-ecosystems interaction in Maruleng Municipality and the governance frameworks managing these interactions.

Ecosystem services

The benefits people obtain from ecosystems – these include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services such as nutrient cycling that maintains the conditions for life on Earth (Corvalán *et al.*, 2005).

This study will explore two components of ecosystem services; the supply thereof through natural systems, these include elements such as arable farm lands through nutrient cycling processes, water through rains and rivers and the wild animals dwelling in the Maruleng area. These are the naturally occurring systems that have come to be in the Maruleng area irrespective of human involvement in the system, and will remain in the area whether it is utilised by humans or not.

The demand side of ecosystem services consists of the way humans are utilising the naturally occurring systems in the area. This includes how the water and land are put to use as human need arises. An example of this is the fact that the Lowveld is traditionally best suited to game farming and nature reserves as the soil is not highly arable and vast amounts of water do not exist in the area, neither do rich mineral deposits. This has meant that the natural abundance of charismatic wildlife has led to a demand for tourism (cultural ecosystem service) in the area.

Adaptive Management

Adaptive management refers to a management approach that recognises the complexity of the systems we as humans try to manage through embracing a complex adaptive systems approach. It simply means that this approach focuses on the realisation that planning and management has to not only have a pro-active, but also a reactive approach, because the systems it is trying to manage is non-linear by nature and thus has to be managed adaptively (Pollard and Du Toit, 2008).

1.7 OUTLINE OF CHAPTERS

Chapter 1: Introduction

The purpose of chapter 1 is to provide a background as to why this research was undertaken. In this chapter, the motivation and background to the study is discussed, and the main research question is formulated. Together with this, a number of sub-research questions are identified which the researcher endeavours to answer during the development of the study. Also discussed is the type of research methodology that will be used, namely, a case study that the researcher uses to gather data in order to answer the basic research question.

Chapter 2: Literature Review

The Literature Review will take a detailed look at certain theories, approaches and tools, identified as key for creating an enabling environment for a stronger ecosystems approach to land use and spatial planning at local municipal level. The theory behind systemic thinking – intrinsic to an ecosystems approach – is discussed in order to see how it can contribute to planning for more resilient socio-ecological systems (SES). Ecosystem Services (ES) is the key angle used with which to better inform and create an interposing point for the ecosystems approach at local municipal level. Finally, Adaptive Management (AM) is suggested as a tool that will help allow municipalities apply an ecosystems approach as they focus on better management of complex and adaptive systems.

Chapter 3: Institutional Arrangements Overview

The Institutional Arrangements Overview chapter focuses on the current status quo of spatial land use, as well as environmental-planning in the South African context. It helps create a better understanding of the current legislative environment for incorporating an ecosystems approach into land use and spatial planning. An analysis of the legislation, plans, frameworks and other tools, currently available as vessels for the promotion of an ecosystems focus within spatial land use planning, will take place. A better understanding of the institutional environment within which spatial land use planning happens for Maruleng Local Municipality is created. The enabling environment for taking a stronger ecosystems approach within the municipality is then explored in order to see what the current approaches are and how they can benefit ecosystems focused planning.

Chapter 4: Contextual Analysis of the Values, Social, Technological, Economic, Environmental and Political Features of Maruleng Municipality

As part of taking a systemic approach, and as part of better understanding the socio-ecological systems within the Maruleng Municipality, a VSTEED approach is utilised. Within the VSTEED approach a better understanding is created of Values; Social; Technological; Economic; Environmental and Political variables within the municipality. The largest focus is placed on the environmental aspect, with a strong ecosystem services approach, that aims to highlight and map direct dependencies on ES within the municipality.

Chapter 5: Exploring the Possibility of Taking an Ecosystems Approach to Spatial Land Use Planning

Moving away from environmental and biodiversity planning to a systemic ecosystems approach in order to promote the resilience of Maruleng's ecosystems is explored in this chapter by reviewing the VSTEED chapter and gauging whether it can add any value to the existing planning tools used in the municipality. The value added by such an approach within the legislative framework is assessed in order to explore the viability of such an approach as well, specifically looking at the constraints currently existing in the spatial land use planning setup and what it would take to alter the planning paradigm within the said municipality.

Chapter 6: Recommendations and Concluding Remarks

The findings from the VSTEED are utilised to justify a stronger ecosystems approach, as it clearly shows the large dependencies people within Maruleng have on healthy ecosystems and the services they provide. Within the findings, the feedback from people interviewed is also analysed to help supplement the findings from the Institutional Analysis chapter, in order to create an understanding

of whether the legislative environment is conducive to a stronger ecosystems approach, and whether there is a demand for this type of approach from the people living in the Maruleng area.

CHAPTER 02: LITERATURE REVIEW

2.1 INTRODUCTION

The Literature Review chapter will lay the foundation for this research by grounding the theoretical approaches taken towards improving spatial land use planning in already existing frameworks in order to ensure the latest academic trends are followed. There are several theories and tools that will be used. They were all specifically chosen because, they as a set, are believed to create the best possible framework with which to improve spatial land use planning. The theoretical framework contains key features from Post Modernistic (PM) Thinking; Systems Thinking, Complexity Thinking and Resilience Thinking. These four theories are already interconnected through some key principles – each also brings forward its own unique theoretical angles. Moreover, each of these theories and their most important attributes for the purpose of this thesis, will be discussed below. Except for the theoretical departure points, Ecosystem Services (ES) will be used as the angle with which to look at the relationships between humans and nature in the socio-ecological system (SES). It is more of a practical orientation helped to define the SES used, rather than a theory and is therefore referred to as an angle. Finally, when having the theoretical departure points and the ES angle in place, one needs what is perceived to be a ‘tool’ with which to address the current emergent issues around spatial land use planning. For this Adaptive Management (AM) is used because of its ability to fit in with all four the theoretical dimensions (Pollard *et al.*, 2014). The theoretical departure points, angle and tool chosen, will act as the framework with which the thesis addresses the overall approach towards achieving the objectives – for example, this thesis has a whole chapter on the status quo of the Maruleng area. This is done because the theories within the theoretical framework strongly suggest that the area be understood well as a system before moving towards decision-making processes.

Below is a detailed discussion on the theoretical framework, angles and tools used, whereafter a more detailed discussion will follow on how and why these were chosen – in order to ensure that the reader is well aware of the approaches used and why.

2.2 THEORETICAL FRAMEWORK

The theoretical framework will explore existing theories and what would be most suitable to use when analysing the status quo of land use and spatial planning within the Maruleng Local Municipality (MLM), and the issues emerging from this analysis. The idea behind the theoretical framework is that

it will help better understand key concepts from the schools of thought being discussed below – and then using that to structure the sense making process that will guide this research. In order to achieve this the theories chosen will all be relied on in one context or the other, with particular angles of interest being used in an interlinked way with other theoretical departure points.

2.2.1 Post Modernistic Thinking

Post Modernism (PM) is used across such a wide field of studies and as such, it has a very expansive field of definitions (Haddad, 2009). It can, for example, be used when talking about anything from contemporary art to religion and architecture. PM is important to embrace because it promotes certain ways of thinking that are of the essence if one wishes to achieve a state (of land use planning and management) that promotes collective action in order to ensure changes in the behaviour of the actors involved are possible over an extended period of time.

The basic beliefs of PM, for instance ownership, is of the essence as it promotes collective action. Collective action on a global scale is what is needed if a truly sustainable system of living on earth is to be found (Snell, 2009; Haddad, 2009). Another important belief is that of Pluralism. It states that all the different paradigms and approaches to reality in the global society today can be true. This is very important because many spheres are involved in promoting sustainability in land use and spatial planning. All these spheres have their own unique approaches and theories to make sense of their surroundings. Pluralism states none of these are wrong and that they should all be considered in sustainable development approaches (Korhonen, 2008), which this study argues is a key component of effective land use and spatial planning. One of the most important dimensions of PM is its rejection of any form of homogeneousness, which is very similar to Resilience Thinking (Biggs *et al.*, 2015; Folke *et al.*, 2010). This is important in promoting a sustainable future because it helps by making decision makers realise the process of promoting effective land use and spatial planning is a multi-faceted process that needs to be applied across all different components of human life, whilst also considering the opinions of all involved in the actual planning processes (using a bottoms up approach). It cannot simply be achieved through homogeneous techniques, but will involve all the parts of the organism to function collectively (Rammel *et al.*, 2007). An example is that governmental spheres can do all the land use and spatial planning they wish for an area but if the people who actually live there do not buy into the processes change will be hard to achieve. This move away from traditional thinking is of the essence as old techniques (such as the classic top down approach) to promote SD have so far failed (Egoh *et al.*, 2012). According to Vojnovic's (1999) conceptualisation, PM addresses the notion that old ideas are obsolete and that new “truths” should be found in the search for a sustainable future,

allowing for retro- and introspective reflections on what was done, why it was done wrong and how one could possibly attempt to improve it.

PM is not a theory that will be focused on excessively in this study. It is, however, important to include on the basis that it helps guide the thinking processes involved when engaging with the status quo of the current land use and spatial planning developments. Its focus on Pluralism creates a state of mind where the realities of all parties affected by spatial land use planning are considered – a key concept to what this thesis believes will create collaborative action when reaching the point where the planning needs to be implemented at ground level.

The continuous assessment of the planning processes, as would be evident through the fact that PM acknowledges that truth is subjective, is of the essence to help create a holistic approach that keeps track of changes to ensure that the right truths are implemented en route to SD (Whitty & Biberman, 2012). This can be closely linked to the angle taken by particularly the Adaptive Management approach through its focus on feedback loops (Fischer, 2003), which this research argues is key to help create land use planning and management that occurs collectively amongst not only governmental spheres but also creates buy in from civil society.

2.2.2 Systems Thinking

According to Laszlo and Krippner (1998: 02), *“A system in its broadest conception may be described as a complex of interacting components together with the relationships among them that permit the identification of a boundary-maintaining entity or process.”* This crux of the general systems theory that everything exists within, and is made up of, interacting systems helps shape a different state of mind when analysing scenarios. It promotes doing away with reductionist types of thinking (Cilliers *et al.*, 2013). An example of this is the way the natural environment and humans co-exist – they do not do this in silos but in an interactive sphere of inter-connectedness, called the SES (Halliday and Glaser, 2011). Using the SES concept, it can be argued that the degraded condition in which the environment currently finds itself the world over can be attributed to the fact that humans do not yet fully understand the interlinked spheres of the human and the natural environment system. Systems Thinking combined with Complexity Thinking aim to right this fundamental wrong through attempting to better understand the processes involved in the interactions between spheres and the components that make up these spheres. Such a large amount of focus is put towards understanding the processes because that in the end allows for a holistic understanding of the problem as a multi component system in constant flux (De Chazal, 2010). This is most important as according to Laszlo and Krippner (1998) it allows for treating of the disease of environmental degradation, not simply the symptoms,

but a scenario which has been played out over and over again in the attempts to achieve sustainability and protection of ecosystems. For improved spatial land use planning with a specific focus on improving biodiversity management and protection it is thus an obvious must as a theoretical departure point. The constant levels of change present also mean that a Systems Thinking approach will be best suited to promote land use and spatial planning that will bring about sustainable changes in the long run as they focus on creating adaptability moving forward. One of the most important ways of making sense of a world in constant flux – with changes occurring in irregularly dispersed patterns – is the delineated patterns with which Systems Thinking analyses scenarios. It makes it possible to replace old, reactive ways of dealing with problems with that of a more creative and proactive way of understanding and management (Preiser, 2012; Emmeche, 2004).

One of the most important concepts for this study, emanating from the Systems school of thought, is the idea that one gets open and closed systems (De Chazal, 2010; Plieninger & Bieling, 2012). A closed system is one in which the amount of external influences is limited/eliminated. This is the type of systems found in laboratory experiments and analyses. It is created to simulate certain scenarios but usually it is in a controlled environment in which unwanted external influences are removed. Much scientific knowledge is derived from creating these isolated circumstances in which only certain factors play a role and are measured. This helps create more accurate results through helping to track the cause and effect routes involved more directly (Rogers *et al.*, 2013). The open system is, however, the one of interest for this research. It sees the world as a whole and as a system in which multiple factors influence each other (Pollard *et al.*, 2014). This complicates systems massively and makes it almost impossible to track and monitor all the events taking place within the broader system (Rammel *et al.*, 2007). When working on something such as land use and spatial planning that occurs within a complex SES, a closed system approach will never be sufficient, as it will simply not allow for understanding all the drivers evident within the field of focus (which exists in a real world scenario, and not one where drivers of change can simply be eliminated, as within closed linear research). The fact that this thesis centres around a multi-disciplinary management research question, instead of a strictly science based one, denotes that a lens that focuses on multiple factors in an open system, such as that of the systems thinking, will be of the essence.

2.2.3 Complexity Thinking

Complexity Theory and the concepts behind it is still a young and developing school of thought – the Complexity Epistemology emerged in the 1990s. One of the big drivers behind the emergence of Complexity Theory is its endeavour to combine several sciences and act as a merger for traditionally ‘softer’ sciences (i.e. political and management sciences) and the usually ‘harder’ sciences (i.e. studies

of the physical environment or biological processes) (Nooteboom, 2007). According to Innes and Booher (2000: 178): “Complexity theory suggests that the world is more like an organism, growing, evolving and adapting to its environment and that policies fail because of random events, unanticipated technological change or patterns in the economy”. This definition states the opposite of traditional beliefs that the world is like a machine that can be utilised as pleased, taken apart, understood and put together at will. The theory in essence gives the natural environment, its resources and the way we humans manage it, attributes of a living organism, creating a “cause and effect” scenario (Rammel et al., 2007). The idea behind studying cause and effect scenarios is that it helps better understanding not only of the components of a system, but also their interactions with each other. However, many institutions and people still believe, for example, that natural resources can be exploited without any systematic and systemic effects (Preiser, 2012).

This consumptive driven world is, however, slowly starting to see that their beliefs are irrational through many natural sinks being filled by pollution and resources becoming scarcer because of usage based on seeing the world in a mechanistic way (Stankey *et al.*, 2005). Complex Theory states that every stakeholder involved in the consumption of earth’s resources should do so whilst being aware of the effects of each decision they make in their consumption processes, as it all has small but collective effects (Nooteboom, 2007). In the end this collective effect is the true danger to earth and its sustainable usage. For this reason, it is argued that it is a must to understand the collective effect spatial land use planning has on an area. There is a need to produce an overall view of all the pieces of the system, and their interaction, in order to understand the system better as a whole to ensure that we can use spatial land use planning as an adaptive natural resource management tool that will help preserve biodiversity and the ES it provides humans.

The move away from these traditional reductionist methods of trying to study the world in an attempt to bring about a decline in the continued degradation of ecosystems, was facilitated by the fact that massive amounts of resources were invested into decreasing these processes of ecosystem degradation without success (Emmeche, 2004; Fischer, 2003; Holling, 1973; Nooteboom, 2007). This, according to Pollard *et al.* (2014) prompted scientists to start questioning the conventional Newtownian based scientific methods used. This finally led to the challenging of these reductionist world views, ending up with pioneers such as Ludwig von Bertalanffy, widely considered to be the father of systems thinking, moving away from traditional science through his belief that systems were not mechanical, but open and organic in nature, as visible in his publication, *The History and Status of General Systems Theory* (1972). This was arguably one of the starting points of acknowledging the

complexity of the world we live in and the need for scientists and institutional managers to embrace and study it.

Part of embracing the complexity of the world as a system is trying to understand some basics of these complex and adaptive systems (CAS) that act in an organic and unpredictable way. Below are a few general points of understanding as emanating from Complex Adaptive Systems:

- CAS are composed of a network of many components that are continuously learning and act in parallel with the environment created by their interactions.
- The system co-evolves with its environment.
- Order is emergent and in constant transition, instead of functioning and developing within pre-determined structures.
- CAS tend to exist in spheres of organisation with components at one level being the building blocks for components on other levels (i.e. an ecosystem is made up of organisms, which in turn, is made up of cells).
- CAS, by their nature, have a future that is hard to predict.

(Dodder and Dare, 2000; Hubler, 2007; Schneider and Bauer, 2007)

Complexity Theory and CAS are an attractive thinking school because they provide a substitute to traditional reductionist and linear attempts to understand systems. Özer and Şeker, (2013: 90) state: *“The Modernist Era of public policy praised the instrumental rationality governing the design and implementation of policies and called for an unquestionable trust in values of such rationality, order and systematic approaches, assuming that organizations were unified, rational actors.”* Moving away from this assumptive, reductionist and rigidly structured modernist era way of thinking to acknowledging that most systems are highly complex and allows for an attempt to create a more holistic understanding that allows for more organic and adaptive forms of management as a necessity because today’s policy and governance challenges can/should be seen as more of a creative problem solving job than a systematic process (Cosens and Williams, 2012).

2.2.4 Resilience Thinking

2.2.4.1 Background

Resilience as a concept was introduced by Holling (1973: 02) in the field of ecology. According to him, *“resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb change of state variable, driving variables, and parameters, and still persist”*. Holling’s (1973) definition is, however, rudimentary and through the three to four decades that have passed since, a lot more SES context focused work has been created, thus being more

suitable for this research than the older, strictly ecological focused work by Holling (1973). One such an academic is Walker who defines resilience as “*the capacity of a socio-ecological system to absorb disturbance and re-organize while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks,*” Walker *et al.* (2004: 03). This definition provides for a holistic view of what resilience should be in the broader SES field as it acknowledges the complexities involved in the notion of resilience. This is done through the acknowledgment that resilience and creation thereof is influenced by the environment, as well as humans and their interaction with it.

2.2.4.2 Resilience in practice

Resilience is, by the nature of its complexity, a fuzzy term – it could mean such a wide variety of things that for practical application it really has to be specified. Walker and Salt (2012: 41 & 44) therefore coined the phrase ‘resilience of what, to what?’ Looking at the ‘of what’ it is key to look at the system and identify the key items you wish to become more resilient. The aim of using Resilience Thinking is to focus on sustainably building capacity at a local government level in order to better deal with unexpected changes, and make the management systems more rigid. Thinking practically into achieving this goal means the ‘of what’ may include, for example, what set of Ecosystem Services one identifies as key for promoting human well-being. The ‘to what’ question is, in turn, answered by looking at certain drivers (events/scenarios), having an influence, or threatening the ability of – as in the abovementioned example – ecosystem services to promote human well-being (DeFries *et al.*, 2005; Walker and Salt, 2006). A key negative driver could for example be a huge fire sweeping through the research area, destroying key ecosystem services such as grazing fields for cattle, and having a negative impact on the people of the area’s well-being through reducing food stocks. The overall idea is thus to make the ecosystems existing in Maruleng and the broader area more resilient to negative and degrading drivers, with truly integrative land use and spatial planning seen as a tool with which to achieve this.

2.2.4.3 Seven principles for building a resilient SES

The Stockholm Centre Resilience Centre has released seven principles which it believes are essential for building resilience in SESs:

- Maintain diversity and redundancy.
- Manage connectivity.
- Manage slow variables and feedbacks.
- Foster complex adaptive systems thinking.
- Encourage learning.
- Broaden participation.

- Promote polycentric governance systems.

(Biggs *et al.*, 2015)

Although there is no panacea for building resilience the abovementioned principles, if applied within the context of having a nuanced understanding of where, how and when to apply them, as well as how these principles are interconnected and influence each other, will allow for the creation of a more resilient SES. The principles help one take an approach that moves beyond seeing people as external drivers of ecosystem dynamics through making us and our demands part of the constantly interacting biosphere in order to help us understand how we can manage our dependency on ecosystems and the ES it provides (Walker, *et al.*, 2004; Walker and Salt, 2012, Berkes and Folke, 1998). The idea behind this is that planning and governance should not only look at how humans can benefit from ES, but also how they can ensure the integrity of the ecosystem in order to make sure that it can, in a sustainable and resilient way, provide us with the ES needed to promote human well-being (HWB) (Alcamo *et al.*, 2005; Plummer and Armitage, 2007).

2.3 ECOSYSTEM SERVICES ANGLE

2.3.1 What are Ecosystem Services

To understand what Ecosystem Services (ES) are, one should first get to grips with what an ecosystem is. The Millennium Ecosystem Assessment of 2005 (MA), according to Mooney *et al.*, (2004), defines an ecosystem as a dynamic and complex system consisting of animal (humans fit in here), plant and micro-organism communities, as well as the non-living environment, interacting as a network to create a functional unit. A well-defined ecosystem has strong connections and interactions amongst its components and less pertinent ones across its borders (Lead *et al.*, 2005). These borders come in vastly different shapes and sizes (i.e. a particular soil type, a catchment area, a certain biome or even one particular tree) which all exist connected and inter-nested in each other, with the largest overarching bounding of the ecosystem being planet earth (Rodriguez and Agard, 2005). The boundaries of an ecosystem are often difficult to estimate and even though boundaries are set, there is often – as would be the situation in the case study for this research – external drivers influencing the interactions between the organisms within the particular ecosystem (Braat and De Groot, 2012).

Moving on to ES then, one should understand it as the benefits/services humans obtain from these ecosystems and the way they function. This is the simple definition that will be discussed in more detail below. It is important to note that the most widely accepted and academically used understanding of ES originated from the MA 2005 (Mooney *et al.*, 2004) initiated by the then United

Nations secretary-general, Kofi Anan, in 2001. The aim of the MA was to assess the effects of ecosystem changes on HWB, whilst also determining what actions are required to enhance conservation and sustainable use of these ecosystems.

The MA focused on how changes in ecosystem services have affected human well-being, how ecosystem changes can possibly in the future decades affect human well-being, and what types of responses can be adopted at local, national and global scales to improve SES management, thereby contributing to human well-being and poverty alleviation (Butler *et al.*, 2005).

2.3.2 Classification of Ecosystem Services (ES)

There are different bundles of ES provided by ecosystems (both natural and humanly modified); these benefits can manifest themselves in both a direct as well as indirect forms (Costanza *et al.*, 1997). An example of an indirect benefit is things like soil formation, water and nutrient cycling. The ability of an ecosystem to provide ES often depends on the health of the ecosystem providing it. ES can be provided by the natural environment or through human modification, for example agriculture, or a man-made dam (Müller and Burkhard, 2012). There are obvious trade-offs which exist between the types of ES produced under different ecosystem scenarios (Bagstad *et al.*, 2013; Crossman *et al.*, 2013; Dick *et al.*, 2011).

Figure 2.1. below is a graph depicting the four main types of ES and the subsets which fall under them. These include:

- **Supporting Services:** These form the backbone of ES as they are needed for the production of the other three ES types. It includes fundamental processes such as nutrient cycling which ensures that, for example, food production can take place.
- **Cultural Services:** Subject to personal needs and desires, these consist of the cultural and religious values taken from an ecosystem.
- **Provisioning Services:** The most direct and tangible ES, this includes the likes of freshwater consumed within a catchment or food produced on a farm.
- **Regulating Services:** Some of the most important functions of a healthy SES sits within this form of ES, including elements such as natural hazard regulation through, for example, a wetland slowing down a river's flow.

(Bagstad *et al.*, 2013; Müller and Burkhard, 2012)

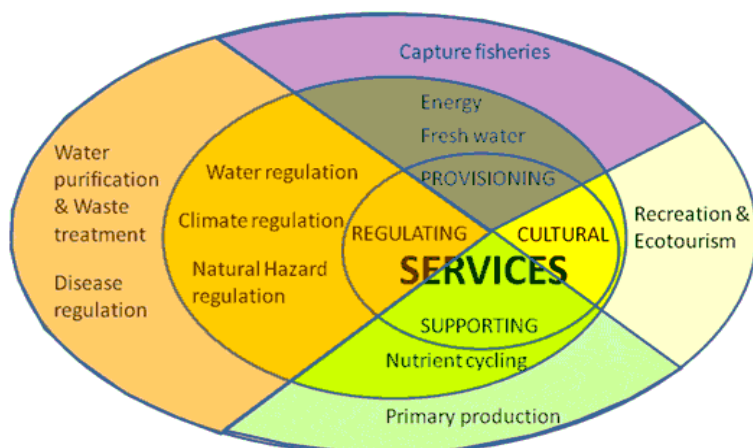


Figure 2.1 Ecosystem Services and its Four Subsets (Butler *et al.*, 2005)

2.3.3 Valuing ES

Taking a step back, one needs to look at the measuring and valuation tools at our disposal and how these compare to what is being measured when looking at Ecosystem Services (ES). It is clear that ES are of immense value to people. Some approaches and techniques currently attempt to deal with the “failure of the market” to assign economic values to ecosystem services. But whether these methods can ascribe accurate values to ecosystems and their services, is still a highly debatable topic. This is due to the fact that when looking at the valuation of systems with which we currently try to understand our world, it is clear that they are greatly driven by economic valuation systems that use the universal currency of monetary value (Derissen and Latacz-Lohmann, 2013). One of the main tools with which there is being attempted to value ES in economic terms is approaches such as Payment for Ecosystem Services, which are based on monetary standards.

This study, however, sees the current methodologies for this as inadequate and highly dependent on context, thus it tends to be subjective and impossible to determine for the broad range of stakeholders, or involved parties, who benefit from the specific type of ES bundles delivered. The problem is that the methods available try to take traditional linear approaches in order to explain something that is part of a highly complex and interconnected SES (Cumming *et al.*, 2013; Matzdorf *et al.*, 2013). The assumption made with the ES approach is that the healthier the ecosystem is, the more benefits humans can derive from it, thus providing an explicit beneficiation model that can be attached to and promote the protection of ecosystems. This is clearly a human-centric approach linking to what William Baxter (1974) states in *People or Penguins: The Case for Optimal Pollution* where nature is seen as worthy of being present as long as it provides us with value, in other words it serves the sole purpose of being a means to an end for humans. Especially looking at SA where the socio economic scenario most people find themselves in is so dire, HWB and upliftment are rated as very important.

ES allows for the intrinsic value of the benefits provided to HWB by it to become clearer. This assists development policies and planning to actually see the value of nature, and help promote the protection and sustainable use thereof. The realisation that healthy ecosystems have benefits (direct and indirect) is important, helping to influence decision and policy makers at management level (Egoh *et al.*, 2012). A well known example of ES beneficiation is bees and the service of pollination that they provide. It is well known that bee numbers are declining due to various factors. In the USA for example by 2006 half of its bees had disappeared (Watanabe, 2007). This creates a scenario where pollinating has to be done by people or mechanically. Only through practical examples such as these are people starting to realise the free services a healthy ecosystem provides. The ES approach is in essence trying to instil the realisation that healthy ecosystems provide all these services for people, thus people need to protect it (Corvalán *et al.*, 2005). The ES aim is to ensure humans understand that creating a symbiotic relationship where we protect ecosystems allows us to benefit, saving us the costs that there would be should healthy ES be destroyed and we as a consequence had to deliver these services ourselves.

2.3.4 Linking ecosystem services to human well-being

In conservation science there has been a strong movement away from traditional eco-centric conservation approaches to that of a more human-centric one (Sattout, 2013). According to Sandifer *et al.*, (2015); Skroch and López-Hoffman, (2010) a human-centric approach holds several advantages over traditional conservation methods. The best known human-centric conservation approach is ES (Dick *et al.*, 2011). It is most popular because it allows for the explicit valuation of benefits derived from ES by humans, helping to make matters more explicit why protecting ES is important if we wish to continue benefitting from them. ES thus helps us make direct links between the constituents of HWB (security; basic materials for a good life; health; good social relations and the overarching principle of freedom of choice and action) and the ecosystems within which we co-exist (Corvalán *et al.*, 2005). Below, in figure 2.2, these direct links are illustrated, helping create a better understanding of how humans are linked to ecosystems and are dependent on them within the SES.

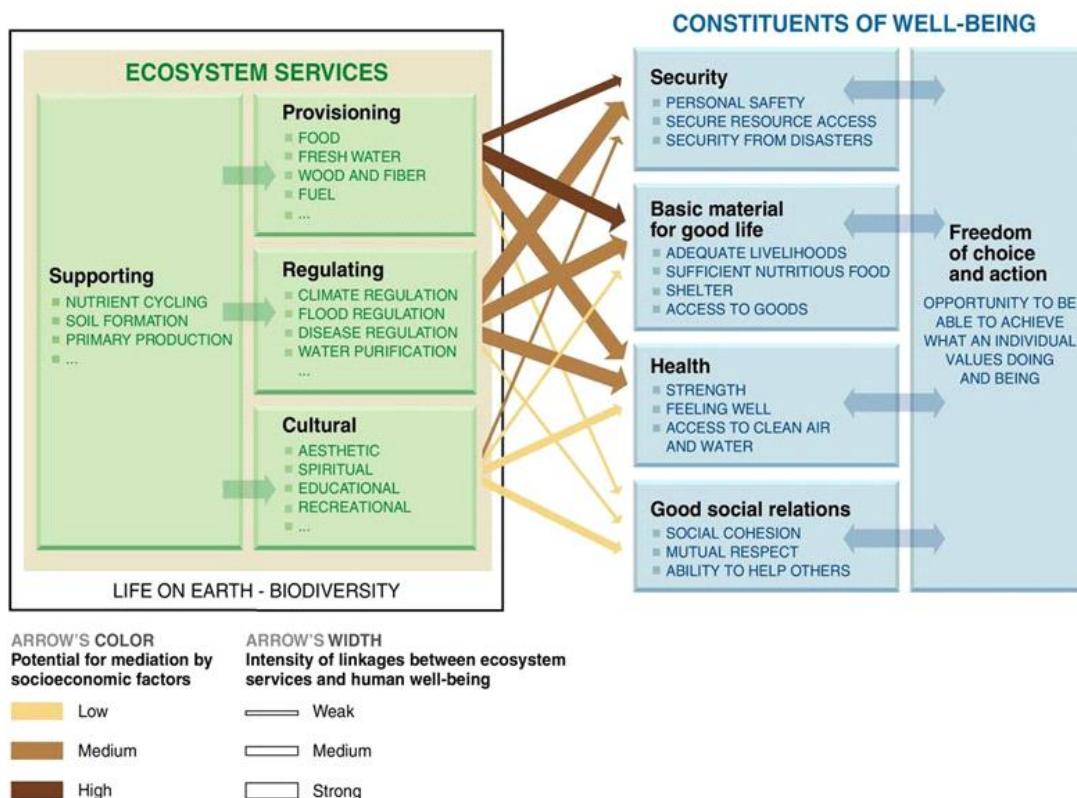


Figure 2.2: Linking Ecosystem Services and Human Well-being (Butler et al., 2005)

Breaking ES down a little further means one can separate the ecological side of the SES from the social (anthropogenic) side. This puts ES into two categories:

- What services ecosystems can supply (ES supply).
- What demands people place on ecosystems (links to constituents of HWB).

(Braat and De Groot, 2012; Bryan and Crossman, 2013)

One of the largest issues with the abovementioned linkages between HWB (linked to ES demand) and ES (supply) is, however, that quantifying it is extremely complex, and as of yet no universal measure or framework with which to do this exist due to, as expected when taking a systemic approach, there is:

- Subjectivity issues.
- Difficulty in bounding the system (temporally and geographically).
- Data collation and collection difficulties.

(Dick et al., 2011; Müller and Burkhard, 2012)

The value biodiversity has to humans and the fact that measuring it is difficult because it is such a fundamentally complex system that one has to define and quantify to understand, does not, however,

mean we should not take the approach. Resilience Thinking is a holding theory in this thesis and when looking at improved land use and spatial planning the aim is to promote general resilience of the SES. To promote resilience a focus needs to be put on the vulnerable aspects of the system and how to strengthen them (Walker and Salt, 2012: 11). Hence in this study there will be much focus placed on the vulnerable parts of the system and how to make these more resilient. Thus improving the HWB of the poor is of the utmost importance, with improving ES delivery seen as a key way of achieving this, because as quoted by Butler *et al.*, (2003), “*for poor people, the greatest gains in well-being will occur through more equitable and secure access to ecosystem services*”.

2.4 ADAPTIVE MANAGEMENT AS TOOL WITH WHICH TO IMPROVE SPATIAL LAND USE PLANNING

Acknowledging that we find ourselves in a complex world that does not simply work like a machine, but acts as a living organism in the type of actions and reactions generated during interactions of its parts, is a crucial part of subset ideas shaping complex systems thinking. Adaptive Management (AM) is a tool/mechanism that acknowledges the workings of the complex world we live in, thus focusing on creating management and planning principles that cater for these situations (Pollard and Du Toit, 2008). AM is seen as an effective tool with which to address land use and spatial planning within a SES because it acknowledges the integrative, multiscale, long term and fluidity aspects of managing a non-linear system (Stankey *et al.*, 2005).

AM approaches foster certain ideas to help create improved understanding and management of complex systems. These include:

- Having an underlying conceptual model with which to ground approaches.
- Understanding the system before engaging in management activities (understanding underlying values; technological; economical; environmental and political aspects of the study area).
- Ensuring ongoing monitoring and evaluation.
- Creating adaptive outcomes which can change as understanding of the area changes.
- Promoting cooperation (between citizens, management, scientists and other forms of interested and affected parties).
- Ensuring stakeholder engagement.

(McLain and Lee, 1996; Van Wilgen and Biggs, 2011; Westgate *et al.*, 2013).

To the abovementioned list of key factors, as set out by McLain and Lee (1996), Van Wilgen and Biggs (2011) and Westgate *et al.* (2013), this study proposes the following to be added to ensure further success in understanding and managing complex adaptive systems:

- Create collaborative processes which include the actors of the system and utilise their inputs when planning on how to manage the system.
- Taking bottom up approaches to management and planning.
- Inclusion of PM approaches such as collective action and pluralism (engaging of all the parts of the system in order to bring about positive changes), as well as the idea of obsolete truths, with each individual experiencing different scenarios and putting different demands on land use and spatial planning initiatives.

These will help the AM approach to create a more inclusive approach which in theory will help activate all the smaller parts of the system, helping it to facilitate large scale collective action. This is needed because to truly promote ES resilience building, Folke *et al.* (2005: 443) says that we, “*require new forms of human behaviour with a shift in perspective from the aspiration to control change in systems, assumed to be stable, to sustain and generate desirable pathways for societal development in the face of increased frequency of abrupt change*”.

2.4.1 Feedback loops within the AM approach

Feedback loops are fundamental process links that help feed information back into the management system, helping to promote adaptability of responses and are therefore a key part of AM. A Feedback loop can at its most basic level be described by Figure 2.3 below – it is very much a simplified model of an actually highly complex system, but will be most effective in helping to describe exactly what a feedback-loop system is. For effective change/improvement to occur, evolution is needed. This is only possible if what happens at the output level is captured and that information is sent back to the input level where it is analysed and formulated into the following process phase to change the output, from the previous one to a more adaptable one (Doyle *et al.*, 2013). This process in the natural world happens very slowly, with, for example, evolution favouring certain traits, and eventually after several hundred generations changing the traits and definition of what that certain animal is. A more understandable process is the example of being cold (input), going to stand next to a fire (process), then becoming warm (output). After a while the person becomes too hot though, and that knowledge will be fed back to create a new input to move to an optimal distance from the fire (process). The output will repeatedly inform the input until finally an optimal state is reached. This is a grossly oversimplified example of an effective feedback loop process in a closed system that does not take into consideration any external factors. In reality these situations are infinitely more complex.

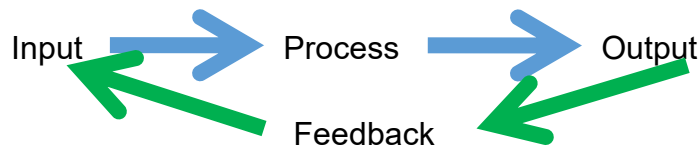


Figure 2.3: Simplified Feedback Loop System (Researcher, 2019)

Feedback loops are of the essence if a system that responds to changes effectively (negative or positive) is to be created. A system that is able to respond to scenarios and remain resilient, absorbing change to remain positive needs to be created (Folke *et al.*, 2010). If feedback loops promoting this can be created and maintained the governmental system currently in place (using the vertical tiers of government) land use and spatial planning can become successful. However, the current hypothesis is that the feedback loops are disconnected and strangling effective flow of information in order to ensure adaptability. To this extent the focus of this research will be on finding whether the hypothesis is true, and if so, how this situation can be amended. This will help feedback loops to once again feed into and help keep policies and planning dynamic and resilient.

2.4.2 The best planning and management option

Both Westgate *et al.* (2013) and McLain and Lee (1996) claim that although AM looks good on paper it does not ensure effective management that will set a project/endeavour up for success. Van Wilgen and Biggs (2011) present evidence that the AM approach is difficult to implement because of the sheer amount of components within a system it needs to track and manage. AM can also easily become cumbersome, with logistical problems and scale problems being major obstacles. McLain and Lee (1996); Pollard and Du Toit (2008) and Van Wilgen and Biggs (2011), however, agree that for increased knowledge acquisition, flows of information, the creation of shared understanding and general management of organic and systemic complex systems, there currently exists no better alternative.

2.5 INTEGRATION OF THE ABOVE THEORIES, ANGLE AND TOOL

The abovementioned discussed overarching theory of complexity and systems combined with the thinking processes of PM, and the tool of AM and ES, are chosen as key points of departure as after various discussions, considerations and procedural understanding, they are believed to be the core elements of a mental model that will help address all the aspects needed to help create an in depth understanding of the systems involved in the governance and management of effective and integrative spatial land use planning.

Complexity and systems is the overarching umbrella from which the rest of the concepts evolve, helping shape the theoretical departure by feeding into the arch, but also in itself drawing from it.

Complexity and systems were chosen for two reasons:

- The first is to identify how the value, social, technological, economic, environmental and political (VSTEEP) processes are shaping the status quo of the research area, as well as how they interact and are evolving through emergence and the influences of the involved drivers. To map and understand the integration and interaction of these traditionally separately managed fields, complexity and systems approaches are the perfect theoretical departure as they allow for true interlinking to help create a holistic SES view using the VSTEEP template introduced by Pollard *et al.* (2014) and Pollard and Hansen (2014).
- The second is to more specifically help focus on the municipal management and governance of the area and the associated land use and spatial planning processes. This will assist in judging the ability of the management structures and also determine the ability to self-organise in complex situations – moreover it helps consider all the drivers and how it will influence the ability of the management system to be successful (i.e. how will certain drivers make the management process more or less resilient in its attempts to deliver with regard to certain criteria) (Cosens and Williams, 2012).

Adaptive Management was chosen as key tool to deal with the complexities of the system involved as it is believed that it will be able to promote adaptive governance, able to change in response to new circumstances, opportunities and problems in order to promote a land use and spatial planning management system that is robust and more resilient to negative drivers (Plummer and Armitage, 2007; Westgate *et al.*, 2013).

ES and the understanding of it enables decision-makers to identify better working options to achieve improved basic human development whilst also retaining goals involving sustainability. South Africa, like so many other developing countries, face a battle to balance economic prosperity and social development with preservation of the environment. ES focused research, such as that done for UNDEP's Millennium Assessments, aims to create the best possible link between sustainability, HWB and protection of ES and thus provides a great way to engage with the scenarios that will be investigated in the case study featured in this research. Moreover assessing the services provided, helps with understanding the trade-offs happening across sectors and with regard to stakeholders

when spatial land use planning decisions are made that involve the environment. This allows one to create a comprehensive assessment of the full impact certain actions (like for instance implementing a certain policy) will have. Finally, using ES is very effective at aligning response options with the level of governance where it can be most efficient. A practical example of this is the multi-scale assessment framework developed by the MA to help assess policy options at all the relevant scales – from basic local policy intervention to international conventions (Alcamo & Bennet, 2003).

2.6 CONCLUSION

Studying the abovementioned literature review makes it clear that taking a broader systems view of land use and spatial planning will be beneficial not only to humans but to the ecosystems within the SES as well. Managing it with AM however, as pointed out, will be a challenge, but one that needs to be taken on in order to ensure a healthier SES through improved and better integrated spatial land use planning and management.

Through the usage of the abovementioned suit of theories the following chapters will be given a theoretical grounding, especially chapter 4: Systemic VSTEOP Overview of Maruleng having a very strong theoretical approach in attempting to make sense of the Maruleng area in a systemic way using the ES lens and the VSTEOP methodology. The abovementioned theoretical angles, the ES lens and the AM tool, will all be brought together again in chapter 6: Findings, Recommendations and the Conclusion in order to see how the principles emergent from the Literature Review in Chapter 2 can assist in promoting the establishment of more resilient and ES friendly land use and spatial planning, and implementation regime.

The next chapter will look at the institutional and governance arrangements nested around land use and spatial planning at local governmental level. It will be done to understand the management and governance system better, and to help identify key areas in the system to intervene (areas of opportunity, as well as those which are vulnerable, in order to better understand how to make the system more resilient).

CHAPTER 03: INSTITUTIONAL ARRANGEMENTS OVERVIEW

3.1 INTRODUCTION

With the natural environment becoming more and more degraded by the day, whilst growing human populations continually put more pressure on limited resources (Guerry *et al.*, 2012: 108), spatial planning for land use is becoming more relevant. Spatial land use planning needs to promote more sustainable development to help relieve the stresses put on the natural environment by human needs. In South Africa – because of recent legislation and the bottom up approach taken by government since the dawning of democracy – spatial planning is predominantly carried by municipalities within the current developmental state paradigm. The local governmental sphere has thus become crucial to engage with in order to promote sustainable usage and management of ecosystems (Ruwanza and Shackleton, 2015: 2). This chapter will discuss key institutional arrangements to achieve the aim of using the local governmental sphere to promote more robust and resilient ecosystems able to better deliver ES. This chapter will synthesise the most relevant information regarding spatial planning, ecosystems related planning and municipal planning in South Africa. These will then finally be brought together by looking at how a more ecosystems-related approach can be taken towards local municipal spatial land use planning. The chapter will be concluded by an analysis of key Maruleng Municipality planning and management documents seen as levers which to engage with in order to reach the goal mentioned in the previous sentence.

3.2 SPATIAL LAND USE PLANNING

Spatial land use planning is seen as a process whereby the government seeks to intentionally plan the development of an area by using the location, nature, and timing to more effectively plan and manage infrastructure investment and development spending. This is done to stimulate, support, strengthen and encourage optimal development and growth in more organised fashion (Oranje, 2010: 55). It is the overarching and binding planning principle that should tie together all the different components of development to create an informed picture of how land use should occur on a spatial scale. According to SALGA *et al.*, (2011: 9) it is today a fully recognised component of effective planning towards achieving national goals and principles by governments the world over. The spatial land use planning processes has also, on paper, become much more integrated with not only economic and social scenarios being planned for, but also the natural environment being viewed as an important input towards effective spatial land use planning and management (Kaczorowska *et al.*, 2015: 3).

3.2.1 Context of spatial land use planning in South Africa

South Africa has a very unique spatial land use planning history – one strongly driven by major political phases such as Colonialism and Apartheid. The Colonial times were driven by the hunger for rapid natural resource exploration and consumption, and it is today still evident in the spatial layout of this country, with major cities all along the coast, traditionally used as ports through which the export of natural resources occurred. Further down the line one can, for instance, look at the discovery of gold in the Witwatersrand area (Turton, 2004: 42) and how that created what today, unorthodoxly is the financial and industrial hub of South Africa (Johannesburg and Pretoria area). The word unorthodoxly is brought into the previous sentence because when looking at the history of major centre establishment, it is traditionally linked with easy access to natural resources necessary for human development, as well as interconnectedness (access to markets). In both the previous instances it is interesting to note that the Witwatersrand area had extremely limited access to other markets – being situated quite far inland – and more importantly had very few of certain key natural resources required for human development. Today the area is dependant on interbasin water transfer schemes to feed the Vaal river in order to help meet the basic need for water (Heyns, 2002: 31). However, these developments – brought about by the colonial phases of South Africa – are not as big a historical driver for the case study area (Maruleng Local Municipality) as what the era of Apartheid was.

One of the key areas of emphasis in spatial land use development and planning in South Africa today is trying to redress the racially unequal spatial development present to this day because of Apartheid laws (Liebrand *et al.*, 2012: 74). The spatial inequality started long before Apartheid with, for instance, the Glen Grey Act of 1884, approved by Cecil John Rhodes with the aim of allowing for the forceful appropriation of land from “blacks” in the eastern parts of the Cape Colony – for railway, missionary and white farmland land use claims. Throughout the years up until 1948 when Apartheid became official policy certain race groups were generally discriminated against when land use planning and development occurred, but after the aforementioned date these racially biased laws were implemented in a systematic and policy driven way. The Group Areas Act (41 of 1950) (RSA, 1950) is a prime example of one of several pieces of legislation put into place in an attempt to force particular race groups into certain areas. The Group Areas Act (41 of 1950) (RSA, 1950) was an expansion of the Native Land Act (27 of 1913) (RSA, 1913), formalised by the Union of South Africa, which reserved 87% of South Africa’s land for whites and only 13% for non-whites (Hendler and Wolfson, 2013: 4 & Oranje and Merrifield, 2010: 33). In conjunction with several other Acts, such as the Segregation Act (19 of 1954) (RSA, 1954), the Group Areas Act (RSA, 1950) caused forced relocations for non-whites and separate spatial development identities to be created for whites and so called ‘non-whites’. These laws and endeavours such as the creation of homelands/Bantustans for non-whites caused the

relative high percentage of GDP expenditure on infrastructure occurring at that time to be predominantly focused on the white minority's needs. This meant that by the peak of this public infrastructure expenditure process in 1976, the main beneficiary of education; healthcare; housing; municipal services and welfare- infrastructure development was the privileged white minority (National Planning Commission, 2011: 458). The result of this skewed development, especially in rural areas such as Maruleng Local Municipality, caused major spatial inequalities. This spatially skewed development not only created major socio-economic issues, but also, when looking at an area from a socio-ecological system (SES) point of view, placed major stresses on the ecosystems and their ability to effectively produce ES.

Since the democratisation of South Africa in 1994 spatial land use planning has featured quite strongly in government documents ranging from policies to implementation plans and acts. This is mainly due to the quest to redress the abovementioned levels of spatial inequality created by the Apartheid Regime (Oranje, 2010: 2). The way in which Apartheid spatial planning separated people based on skin colour causes major issues even until today with certain areas deprived of economic opportunities as a direct cause of the way built up areas were planned under the previous dispensation (The Presidency, 2006: 4).

At national, provincial and local level – as can be seen in the summary of all the relevant legislation below – the South African government has a major focus on improving the socio-economic outlook of the poor in South Africa. This is also quite relevant in the documentation pertaining to spatial development planning, however, through environmental legislation (i.e. NEMA (RSA, 1998a)), and all its extensions) the focus on sustainable use of the natural resources is made explicit. This triangular (social economic and environmental) approach to development, helps ensure that a more holistic and sustainable path is taken. However, the general assumption is that South African policies have been heading the right way, being very progressive and well thought through. On the other hand implementation has gone another route, being seen as lethargic, slow and generally ineffective (Charlton, 2008: 31).

3.2.2 Current trajectory

The current South African paradigm with regards to spatial land use planning attempts to redress the deeply seated spatial inequalities evident in South Africa due to the eras preceding democratisation (Hendler and Wolfson, 2013: 3). The most tangible progress was made during 1998 when a White Paper focused on development planning was published. This heralded the birth of what eventually in 2001 became the Land Use Management Bill. Combined with this a focus by provincial government

was also made to draft legislation on land use planning and spatial development. This initiated the process of clarifying key elements of the legislative and policy framework that enables government (particularly LM) to develop strategies, policies and plans for spatial land use planning in order to help address spatial, economic and environmental issues. Part of the outcomes was defining what the aims of the planning processes were and what was to be achieved – such as key terminology and who would be given which roles and powers in the envisaged procedures (Charlton, 2008: 11). According to SALGA *et al.* (2011: 4), although the objectives and aims for spatial land use management and planning changed radically after the end of Apartheid, the models used still remained the same. Contemporary land use management has its roots in British town planning activities, which originated as a response to the pressures placed on the urban landscape during the Industrial Revolution. The current South African model is based on the 20th Century British and North American modernist planning approaches aimed at regulation orientated development control.

The largest recent South African trend setting event came with the induction of the National Spatial and Land Use Management Act (No 16 of 2013) (RSA, 2013), and for the Maruleng case study area, the Limpopo Spatial Planning and Land Use Management Bill. These will be looked at in detail below as a focus on key legislation and current strategic higher order plans that guide spatial planning and development in South Africa, bearing in mind the focus of this work is on how to promote a more resilient SES through incorporating ecosystems into local municipal spatial planning. Below there will be focus on key departments and strategic plans that could help achieve this.

3.2.3 Legislative framework under which spatial land use planning occurs in South Africa

The legislative framework under which spatial land use planning occurs is extremely broad, according to the Guideline for the Development of Spatial Development Frameworks (Department of Rural Development and Land Reform, 2011) produced by the National Department of Rural Development and Land Reform. The key ones from national and provincial level will be focused on in this section in order to create a better understanding of the environment in which spatial land use planning occurs at local government level.

3.2.3.1 Key spatial planning and local municipal orientated legislation

Municipal Systems Act (No. 32 of 2000)

The Municipal Systems Act (MSA) was enacted in 2000, as part of the decentralisation process of government duties and responsibilities to local municipalities (SALGA *et al.*, 2011: 5; RSA, 2000). Its

ideals were to provide for the core principles, mechanisms, processes and frameworks necessary to enable municipalities to effectively plan and mobilise resources towards the social and economic upliftment of the people within its jurisdiction. The functions of the more developmental focused local governmental administration sphere (local municipalities) is laid out in this Act (RSA, 2000). Of particular interest is chapter 05 which focuses on Integrated Development Planning (IDP), and the development of Integrated Development Plans (IDP) as a “*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,*” (RSA, 2000: 44). One of the core components of the IDP is the development of a Spatial Development Framework (SDF) (RSA, 2000: 40). The SDF and its associated Land Use Management Scheme (LUMS) is targeted by this study as the key components with which to engage the local municipality level to ensure better uptake of ecosystems and ES in spatial planning. The Act and its role as bearer of the principle of spatial land use planning at local level has, however, been replaced by the recently enacted Spatial Planning and Land Use Management Act (SPLUMA) (RSA, 2013).

Spatial Planning and Land Use Management Act (Act No 16 of 2013)

SPLUMA was assented to in 2013 in order to provide a uniform system of regulating land development in South Africa, focusing on a decentralised approach which sees local municipalities (LM) as the implementers of its provisions (RSA, 2013).

It aims to provide a spatial planning and land use management framework that, according to a letter from the CEO of the South African Local Government Association (SALGA) (2014: 03) and SPLUMA (RSA, 2013: 02), aims to:

- Specify the relationship between spatial planning and land use management.
- Provide for effective, inclusive and equitable developmental and spatial planning at the different governmental spheres.
- Provide a framework for policies; principles; norms and standards for spatial development planning and land use management.
- To address past spatial development injustices.
- To facilitate and enforce land use and development measures as set out in legislation.

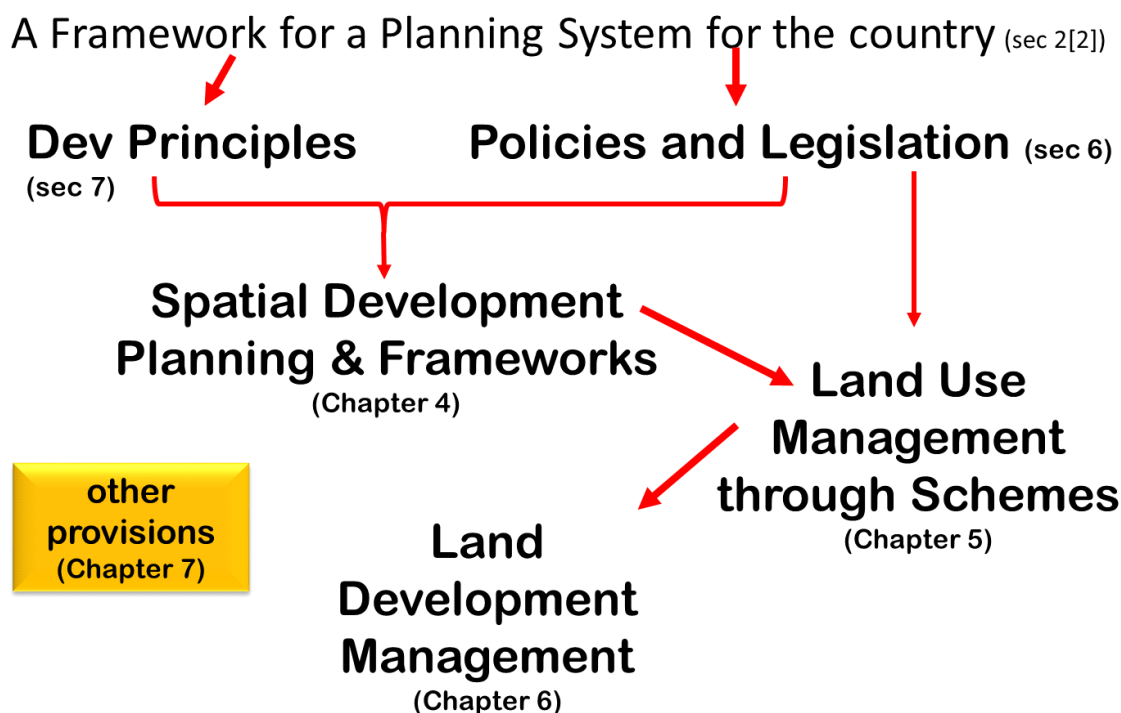


Figure 3.1: Delineation of SPLUMA (Mhlanga, 2014: 3)

Above is a delineated figure of the Act (RSA, 2013) with chapters 4 and 5 being of particular relevance, as it elaborates on Spatial Development Frameworks (SDF) and Land Use Management Schemes (LUMS) as key spatial planning and land use guidance tools for municipalities – this makes it a key intervention point in the system in order to promote ecosystems uptake in local spatial land use planning.

The three key implications of SPLUMA for municipalities are:

- Within 5 years of SPLUMA coming into operation they will need to have Land Use Management Schemes (LUMS replacing current town planning schemes). These will fulfil the role of lending implementation effect to the planning processes undertaken by the SDF.
- Municipalities will receive and process applications for land development.
- Municipal Planning Tribunals will need to be established.

(RSA, 2013: 32, 36, 44)

With all the change to be brought forward by SPLUMA (RSA, 2013) around spatial planning at LM level, there is a unique opportunity to realise a more ecosystems resilience-focussed approach, especially around the SDF and LUMS. With one of SPLUMA's development principles being spatial resilience to ensure sustainable livelihoods (RSA, 2013; Department of Rural Development and Land Reform, 2013: 16), incorporating ecosystems-resilience as a subset of the ability to ensure resilient sustainable livelihoods is fundamental.

The SPLUMA legislation and its well considered and trending approaches is in line with (but lagging behind on some aspects) more prominent ecosystems orientated spatial planning standards at an international level. It however has the potential to be an environmental-resilience promoting piece of legislation (RSA, 2013). A key aspect is its strong focus on decentralisation, also a resilience building factor. This helps to move away from the outdated modernist belief that a centralised government entity should and can rationally plan how space is developed over large areas. In this approach it is very much in line with the decentralisation focus of the Post-Apartheid era, as is, for instance, also reflected in the MSA (RSA, 2000) discussed above.

Limpopo Province Local Government Laws Rationalisation Act (LPLGLRA) (No. 5 of 2000)

The Limpopo Province Local Government Laws Rationalisation Act (5 of 2000) (LPLGLRA, 2000) was incepted in 2000 with the aim of rationalising laws relating to local government within Limpopo through allowing for law reviews that could lead to repeals, extension or amendments thereof, if the review deemed this necessary.

As part of an adaptive management approach this Act (RSA, 2000) is most important. It provides for change through repeal and amendment of acts and sections thereof, creating the realisation that from the paper process, the notion of an adaptive legislation is present. According to Ruhl and Fischman (2010: 481), similar amendment and repeal processes in the United States of America tend to however be quite cumbersome, limiting their effectiveness in insuring legislation adapts at an adequate pace to changes in the real world. The reality is though that robust acts are also necessary to ensure limited power to enforce change, as this change can be positive, but also if in the wrong hands, it can cause negative effects. A key issue which often arises is a lack of effective feedback from implementation level (be it through lack of financial or human resources). This causes a lack of adaptive planning whereby there is a lack of mandated change in the real world even though on paper the processes that could initiate it do exist (Rijke *et al.*, 2012: 76). According to Schedule 1 of the LPLGLRA (Act No 5 of 2000) (RSA, 2000), it has repealed a total of 25 full acts and ordinances, 4 sections and amended only 2, dating from 1903 to 2005. One would imagine that if effective, adaptive management systems were present the number of acts and sections amended, or repealed and replaced, would have been much higher, this however seems not to be the case.

The LPLGLRA (RSA,2000) is important to promote an adaptable government which should lead to a more resilient governing body that is able to anticipate change and put the procedures in place to

manage it. In the ideal world this Act (RSA, 2000) would allow for government to realise that ecosystems and their ability to provide ES is negatively affected by some forms of legislation (i.e. the fact that proclaiming an area as protected under provincial or national legislation is cumbersome and thus needs to be streamlined). The example given manifests itself in Maruleng with certain areas being converted to farmlands whilst they could have been utilised more sustainably and optimally for eco-tourism.

Limpopo Spatial and Land Use Management Bill (LSPLUMB) (2012)⁴

The aim of LSPLUMB (Limpopo Spatial and Land Use Management Bill) (2012) is to present planning and development principles for spatial development. This entails various responsibilities, divided in this Bill (Department of Rural Development and Land Reform, 2012) between provincial departments, municipalities and traditional authorities. The Bill promotes the establishment of a Planning and Development Appeal Tribunal to process land applications and provide a system for appeals. The Bill also ensures that land use development enforcement is possible through providing for the legal framework needed. The aim of the Bill (Department of Rural Development and Land Reform, 2012) is to ensure – through the abovementioned points of planning – comprehensive and uniform spatial planning and land use at provincial level, in order to ensure optimum development of land (a scarce resource according to the Bill) (Department of Rural Development and Land Reform, 2012: 1).

LSPLUMB (Department of Rural Development and Land Reform, 2012: 13) has in mind spatial planning that promotes:

- Economic growth and job creation.
- Cooperative government and intergovernmental relations.
- Effective infrastructure investment.
- Based on normative values reflecting democratic obligations (e.g. extension of development benefits to all people, especially those disadvantaged by previous skewed spatial planning systems).
- Integration of traditional and informal land use with formal spatial planning systems.

The need for feedback loops running from implementation level up to higher governmental tiers is strongly addressed in this concept legislation through stating in its outline that “municipalities must participate in national and provincial development programmes; and planning and development

⁴ By the time of finalisation of this study (September 2019) no evidence could be found of the LSPLUMB being passed as an Act

decisions must be taken by local government, with appeals being resolved by an independent tribunal of experts appointed by the Premier of the Province” (LSPLUMB, 2012: 02). The abovementioned is also stated in the national SPLUMA (RSA, 2013: 05) – clearly showing intent on paper – for a process of reflection between planning and implementation levels.

LSPLUMA (Department of Rural Development and Land Reform, 2012) is still in the process of being enacted, with its parent Act, the National Spatial Planning and Land Use Management Act (16 of 2013) (RSA, 2013), promulgated in 2013. It is arguably the best piece of legislation to help promote effective spatial planning in Maruleng as it provides for a legal grounding point from which to regulate land use and planning.

This Bill fares well in addressing integration issues through its clear focus on insuring IDPs are produced and utilised from local to provincial government level, as well as discussing integrated authorisation management and planning. Chapter 3: Spatial Planning, however, provides no explicit, effective spatial planning guidelines, it only consists of more or less three paragraphs discussing the process of compiling IDPs and SDFs. This creates a scenario where no obligations toward SDF inputs are created. Even though each municipality should have a case specific SDF, it is believed that overall guidelines captured in provincial legislation will give it more legal power on the ground level where implemented – as the case study paper of Mathe (2010) reveals.

Ecosystems are quite neglected in this bill with also a limited acknowledgement of the importance of the environment in integrated spatial planning and land use management. Chapter 11: General provisions do have a subsection on land use sensitive areas, albeit limited in its extent. Possible integration of this Bill with Limpopo Environmental Management Act (Limpopo Province, 2003), or NEMA (RSA, 1998a), is also limited. Although this is not detrimental for environmental protection, because on a spatial level ecosystems and the ES provide for improved human well-being is still able to legislatively be concerned through other processes such as Environmental Management Frameworks (EMF) and Systematic Conservation Plans (SCP). EMFs (under NEMA) and SCPs (under NEMBA) need to be utilised for integrated spatial decision-making and planning at LM level through feeding into SDFs and other planning tools. If these frameworks and plans have not been created the authority loses its teeth, making it less powerful and able to legislatively enforce integrated land use planning that sufficiently incorporates environmental elements.

3.2.3.2 *National and Provincial Strategic Plans guiding spatial planning and development in South Africa*

The national and provincial strategic plans put out by government are generally seen as guidance principles that should help set the trajectory of spatial land use planning and development by orientating and guiding state institutions towards achieving long term strategic goals. These high level plans are not legally enforced, though they are seen as important inputs towards guiding the outcomes of government sectors and will often need to be reflected on via monitoring and evaluation. The institutional homes of these plans are often the highest offices in government (i.e. that of the Prime Minister or President). This occurs in a bid to seat these initiatives in positions of power to promote opportunities of implementation, though often also due to several issues such as a lack of legislative bite and internal politics, they fail according to Oranje and Merrifield (2010: 40). The plans discussed below focus particularly on development and spatial planning.

National Development Plan 2030

The NDP (2011) 2030 is a visioning plan meant to guide development up until 2030 through setting up higher level activities towards which all government spheres should work. There are two anchoring higher level activities which will be worked towards. They are:

- Reduce the number of people who live in households with a monthly income below R419 per person (determined in 2009) from 39% to zero.
- Reduce inequality – as measured by the Gini coefficient – from 0.69 to 0.6.

(National Planning Commission, 2011: 34)

The NDP 2030 (2011) envisages attaining these objectives through 10 critical steps that include reducing poverty, improving education, and other social focus points, but relevant to this study:

- Point 6, focused on infrastructure development (focus on transport energy and water).
- Point 8, focussed around ensuring environmental sustainability.
- Point 9, focusing on spatial norms and standards, looking at improving transport, densifying cities, creating employment in the vicinity of human settlements and upgrading informal settlements.

(Laduma Tapp, 2014: 20 and National Planning Commission, 2011: 34)

The NDP (2011) will act as the overarching framework informing what is to be the government's outcomes for 2030. It will thus, for the 15 years up to 2030 guide the South African government in all their strategic planning and management processes. The fact that the ten steps they listed includes elements such as ensuring environmental sustainability and improving spatial norms and standards, allows for the idea of spatial land use planning to be more ecosystems inclusive at LM level and to be

a reasonable aim that should be backed by the government as it will help them achieve their outcomes for 2030.

National Spatial Development Perspective

The National Spatial Development Perspective (NSDP) was approved in 2003, and renewed in 2007, with the aim of facilitating the understanding of spatial dynamics when development decisions are made (The Presidency, 2006: 1). It provides a national overview of the socio-economic development trends in South Africa in an attempt to recognise different regions and their unique characteristics. The NSDP created five normative principles to act as the backbone for spatially informed development decision-making – these are:

- Rapid sustainable economic growth is seen as a requirement for ensuring the NSDP is successful.
- Basic services should be provided by government to all SA's citizens.
- Government spending on development should be aimed at areas focused on economic growth to promote private sector investment. This should be done to promote the creation of sustainable economic activities and job creation.
- Focus must be placed on addressing current social inequalities.
- Reduce the effect of Apartheid spatial planning through channelling development into activity corridors and nodes close to the most prominent growth nodes.

(Beukes, 2010: 4 and C-plan Development Consultants, 2007: 55–56)

Utilising improved ecosystems uptake in LM spatial planning processes in order to help ensure that the five abovementioned principles are realised, is important. Without effective management of ecosystems and the ES it provides the people of South Africa, achieving the above five principles will be difficult. It is thus disappointing that a sixth point focusing on sustainable and equality-focused usage of ecosystems and the ES they produce were not named as an underlying principle that would have helped realise the original five ones set out in the NSDP (2003, 2007).

Limpopo Employment, Growth and Development Plan

This strategic plan aims to create an economy that is able to improve the people of the province's quality of life through promoting sustainable livelihoods and job creation, and providing for social development, improved healthcare and housing, as well as improving food security and land reform processes (Beukes, 2010: 8). The claim is made that lack of sustainable economic growth and job creation to reduce poverty and improve living conditions, is the central issue facing the province, and

consequently there are high level aims to address this through building economic capabilities and improving industrial competitiveness.

The Limpopo Employment, Growth and Development Plan (LEGDP) is a politically mandated five-year strategy plan developed for Limpopo after the 2009 elections, which the ANC won in the province, and the plan thus aligns with their election manifesto (Limpopo Office of the Premier, 2009: 6). The fact that the ANC won the elections in Limpopo again during 2014 means that a similar LEGDP can be expected for the next political cycle. The plan has a section discussing development programmes seen as key to ensure the plan's goals are met. Part of this discussion is integration which is good to see, although spatial land use planning and environmental integration are ignored in this section – a major flaw, if considering the predisposition and aims of this plan.

The key element of interest in the LEGDP is their focus on sustainable development over the next decade (Limpopo Office of the Premier, 2009: 34). Sustainable Development (SD) is only possible if a focus is placed on managing natural resources better though – the latter is not addressed. This plan will need to take into consideration the SES and how to ensure a healthy relationship between the natural environment and development, and the role of a healthy SES in the improvement of general human well-being. This can ideally be done, through tools such as SDFs and LUMS, though it is not being addressed in the LEGDP context and will therefore make matters generally more difficult.

3.3 ECOSYSTEMS RELATED PLANNING

According to the Millennium Assessment (MA) done in 2005, 60% and more of the ES provided by planet earth is being used unsustainably and is being degraded in the process. The need to go above and beyond what has been done so far to protect ecosystems, is thus a priority. Ecosystems-focussed planning is a step beyond the current international trend of biodiversity planning, which focuses on protecting key biodiversity features according to set criteria. The criteria are traditionally strictly focused on biodiversity features. This type of conservation planning emerged in the 1980s with an approach called the minimum-set, which focuses on protection of the smallest spaces with the largest range of biodiversity features. A more systemic approach developed was that of complimentary-areas, which focused on an assemblage of areas to protect in working towards one overarching goal (Egoh, 2009: 3). According to Egoh (2009: 3), biodiversity planning does cover the protection of most ecosystem services. Although this may be the case the abovementioned finding by the Millennium Ecosystem Assessment, makes it clear that biodiversity planning alone will not allow for the sustainable management of ecosystems and usage of the ES it produces (Von Haaren and Albert, 2011:

151). Ecosystems-related planning promotes a more holistic planning approach which includes biodiversity but also a more anthropogenic focus through looking at features such as demand for ES and socio-economic drivers (Guerry *et al.*, 2012: 108).

Geneletti (2011: 145) stresses some key elements of ecosystems-focused planning that broadens the scope of information needed in assessments from traditional biodiversity planning concepts, such as creating an environmental baseline, looking at sustainability objectives, preparing environmentally friendly plans of action for development and creating alternatives to development suggestions. To this should be added an attempt to have a broader ecosystems focus, elements such as identifying key ES and the ecosystems that produce them, tracking direct and indirect drivers of change for ES, creating a spatial and temporal understanding of ecosystem trends, understanding ES trade-offs and making them explicit, patterns of ES use and creating a clear picture of the cumulative effects of ES on ecosystems with regards to usage.

Geneletti (2011) created a holistic list of what needs to be included in ecosystems-related planning but the concept is still new and only became much more popular after the 2005 Millenium Assessment. As a concept the approach has taken on, especially with academics, due to its systemic focus on creating a SES approach. As with the entire systems and complexity approaches, it is still in its embryonic stage when looking at the levels of implementation by governments. Being such a new field, there currently are several challenges around the concept:

- High levels of uncertainty – even from experts – still prevail on the concept, due to the complexity of the systems involved, their specific bounding and the contexts which exist within them.
- Different values put on different ES by different stakeholders (no clear valuation system for ES as yet).
- Lack of data (for creation of the outputs, as described by Geneletti (2011), which is highly complex and often not available).
- Implementation issues due to decision makers, the public and the scientists all having different perspectives.
- Lack of implementation models with which to work for decision makers.

(Kaczorowska *et al.*, 2015: 2 and Von Haaren and Albert, 2011: 150)

Now that a better understanding of the origin, concept and challenges of ecosystems focussed planning has been done, the focus will be on its current context and trajectory for South Africa. This

will include looking at relevant legislation and strategic plans that have some concept of the approach, or could play a role in facilitating it becoming more prominent at local municipality level.

3.3.1 South African context and current trajectory

According to Egoh (2009: 4) a study was done for South Africa, measuring the number of times ecosystem services were considered in conservation assessments. The result was that less than 5% did so. With the inception of the South African National Biodiversity Institute (SANBI), the 2005 Millennium Assessment and a general international upward trend in the focus on ecosystems-focussed planning, South Africa has also experienced an increased focus on ecosystem-type approaches in research initiatives. With the focus of this thesis being on implementation by the government, the main area of interest is how often ecosystem-approaches are taken in legislation, strategic plans and local planning documents. A quick survey showed that at implementation level, only SANBI has an explicit focus on planning around ecosystems and the ES they deliver through their National Biodiversity Spatial Assessment (NBSA) (Driver *et al.*, 2012). The inception of the National Environmental Management: Biodiversity Act (NEMBA) (No 10 of 2004) (RSA, 2004a) legislated the development of an organisation in South Africa which would specifically focus on coordinating research, giving policy and planning advice and monitoring the state of biodiversity. SANBI was the parastatal arising from this and have amongst other things been acting as policy and planning advisors to the South African government as mandated since 2004. No other governmental entity has to this stage embarked on incorporating an ES lens to work on. This section therefore focuses not explicitly on ecosystems-related planning but rather looks at what key strategic plans and pieces of legislation will promote a healthier SES and also allow for the opportunity to incorporate some forms of ecosystems-focussed planning. The term 'environmental' will be used to describe these pieces of legislation and strategic plans, as it is the broader, overarching concept that is behind an ecosystems approach.

3.3.1.1 Relevant ecosystems related legislation

Within South Africa there is currently no legislation taking into consideration an ecosystems type of approach to improved management of key ES delivering ecosystems. Strong environmental legislation does exist though, taking a more traditionalist environmental conservation approach. Specifically, NEMA and its suite of accompanying acts (NEMPAA [National Environmental Management Protected Areas Act (No 57 of 2003)]; NEMBA [National Environmental Management Biodiversity Act (No. 10 of 2004)]; NEMICMA [National Environmental Management Integrated Coastal Management Act (No. 24 of 2008)]; NEMWA [National Environmental Management Waste Act (No. 59 of 2008)]; NEMAQA [National Environmental Management Air Quality Act (No. 39 of 2004)]) all focused on ensuring a

healthy environmental state (and thus SES) in order to promote improved HWB. There are other Acts important for ensuring a healthy SES as well, such as the National Water Act (NWA) (No. 36 of 1998) (RSA, 1998b), which states that for rivers the Ecological Reserve (ER) has to be maintained to protect the aquatic ecosystems of rivers (De la Harpe, 2004: 18), thus insuring robust and more resilient water resources. Many acts such as the NWA (RSA, 1998b) exist that have peripheral environmental focuses, will not be discussed in this study, although there is a strong case that at local municipal planning levels awareness of, for example, ERs and other relevant environmentally focused sections of other pieces of legislation, need to be acknowledged. Moreover, amongst the suite of NEMA legislations only NEMA, NEMBA and NEMPAA have some relevant spatially linked elements for consideration (as well as NEMICMA, but for the landlocked Maruleng LM case study it is of no relevance) (RSA, 1998a; 2004; 2003). As per the previous section on spatial planning, relevant provincial legislation is also included, although in this case the only applicable piece of legislation is the Limpopo Environmental Act of 2003.

National Environmental Management Act (NEMA) (No. 107 of 1998)

The aim of the Act (RSA, 1998b) is to provide for: “*co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment and procedures for co-ordinating environmental functions exercised by organs of state*”. NEMA was developed to ensure that the right of all South African residents to find themselves in an environment that does not negatively impact their well-being, is realised. It aims to do this through promoting concepts such as sustainable development and the integration of the three factors constituting it (the economic, the environmental and the social) into planning, implementation and evaluation processes with regards to development (RSA, 1998b: 2).

The broad nature of the Act (RSA, 1998b) means that it covers a wide variety of elements specifically focussed on improved environmental management. The Act does state that the local government sphere plays an important role in achieving the Act’s envisaged outcomes. In chapter 3 it, for instance, states that municipalities have to comply with relevant environmental plans (RSA, 1998b: 21). It further states that this can be done through the IDP (of which the spatial planning component is the SDF). LM are not only forced to comply though with chapter 9, section 46, insinuating that if a municipality finds it relevant they can create their own ecosystems-focused tools such as the Environmental Management Frameworks (EMF), or by-laws – on condition that permission is granted by the Member of the Executive Council (MEC) (RSA, 1998b: 60).

The Act (RSA, 1998b) was clearly developed with a strong focus on the ability of a healthy environment to contribute to HWB by seeing the systemic links between these two components because the Act states that it must be “*acknowledged that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option*” (RSA, 1998b: 12).

National Environmental Management: Biodiversity Act (NEMBA) (No. 10 of 2004)

NEMBA was enacted in 2004 as a supplement to NEMA (RSA, 1998a), with the specific aim of providing a legislative home for the practices around the management and conservation of SA’s biodiversity. This meant a focus on the protection and sustainable use of ecosystems, species and biological resources as part of ensuring the fulfilment of the rights of South African citizens under Section 24 of the Constitution (RSA, 1996; RSA, 2004a: 22).

Chapter 3 discusses Biodiversity Planning and Monitoring. Of interest in this chapter is the outlay of an integrated biodiversity planning tool called the bioregional plan (BRP). The plan should contain the components of biodiversity for the region it is developed in, as well as measures for effective management of said biodiversity (Department of Environmental Affairs (DEA), 2009: 9). Section 48 of NEMBA (RSA, 2004a: 46) importantly states that during the adoption of an IDP (and by implication their SDF), at a local municipality under the MSA (RSA, 2000), the municipality must align its IDP with the national biodiversity framework (NBSA), which refers to the National Biodiversity Framework that was finalised in 2008 and gazetted in 2009 (RSA, 2009), with a Draft update released in 2018, as well as any relevant bioregional plans (BRP). They must also incorporate NBSA and BRP provisions into their planning processes, as well as being able to demonstrate how it may be implemented.

National Environmental Management: Protected Areas Act (NEMPAA) (No. 57 of 2003)

The National Environmental Management: Protected Areas Act (57 of 2003) (RSA, 2003) (NEMPAA) aims to ensure protection and conservation of ecologically viable areas that represent SA’s biodiversity through the establishment of protected areas, its management according to norms and standards, and the establishment of a national register of protected areas. Moreover, the aim of this act is to ensure that protected areas are managed through effective intergovernmental co-operation and public consultation (RSA, 2003: 02). Chapter 03 of the Act (RSA, 2003) discusses the proclamation of protected areas. This is most relevant as it has a substantive impact on land use and spatial planning processes as the different protected area type models determine the type of land usage that may

occur once an area is declared. The range of land use activities permitted range from being primarily focused on biodiversity protection (in the National Park model) to models such as the Protected Environment which have far less land restrictions and can be zoned according to the land owners' needs as long as it is in adherence to the norms and standards set out in the NEMPAA Protected Areas Definitions Draft 1 (Paterson, 2009: 21). With Maruleng's most prominent land use type being protected areas (formal and informal) and it also being the largest economic contributor, it is important to take into consideration the land use and spatial implications of this unique scenario. This scenario will be discussed in more detail in the Maruleng VSTEEP Overview Chapter and its implications analysed in the Findings Chapter.

Limpopo Environmental Management Act (LEMA) (No. 06 of 2003)

Objectives of this Act are aligned with its parent act at national level, NEMA, and needs to be applied with the principles set out in Section 2 of this Act. Its specific objectives include managing and protecting the environment, securing ecologically sustainable development, to lend effect to international agreements which are binding with regards to the area, as well as helping with the realisation of Section 24 of South Africa's Constitution (RSA, 1996; RSA, 1998a; RSA, 2003: 18).

Chapters of importance emanating from LEMA (Limpopo Environmental Management Act) (Act No. 6 of 2003):

- Chapter 3: Protected Areas – One of Maruleng's primary economic drivers is tourism through protected areas in accordance with the Maruleng Tourism Plan (Urban-Econ Development Economists, 2014: 28). With protected area declaration creating the opportunity to legally bind certain areas to land use controls based on conservation value, which is linked to tourism in the Maruleng area, it is a great opportunity to secure key ecosystems that underlie direct and indirect socio-economic benefits.
- Chapter 6: Aquatic biota and aquatic systems - Part of a systems approach is to look at the natural system in a complete, systemic way. Aquatic systems such as rivers and wetlands are often seen as the arteries of life in areas, providing key ES to people (Nel *et al.*, 2007: 342 & Turpie *et al.*, 1999: 9). It is most important to include it in a systemic view of Maruleng in order to ensure the improved resilience of these vulnerable system-linking elements.
- Chapter 12: Mountain Catchment Areas (mountain areas) – As will be discussed in the Maruleng VSTEEP chapter in more detail as well, the Mountain Catchment Areas (MCA) (or Strategic Watersource Areas, as more recently referred to by SANBI) on the west side of Maruleng is key in providing ES such as water, as well as being an area highly suited to promoting climate change

resilience (Holness *et al.*, 2014; 12). That area thus needs to be earmarked through the Mountain Catchment Areas prioritisation process as highly important because of all the ES it provides.

- Chapter 17: Offences, evidence, penalties and forfeitures. When making use of legislation and other formal documents to help bring about change in land use and spatial planning focused on protecting ecosystems and the ES it provides, it is extremely important to note that effectively addressing offences is a key part of creating preventative, rather than reactive responses. For this reason, effectively addressing offences through penalties and forfeitures will be important to ensure the ecosystems are protected. Using LSPLUMA, this chapter and spatial overlays of Critical Biodiversity Areas (CBA) from the Limpopo Conservation Plan Version 2 (LCPv2) may be important because it will allow for integrated land use management that promotes a healthy environment (RSA, 2013).

3.3.1.2 Relevant ecosystems related strategic plans

As mentioned previously specific ecosystems focussed strategic implementation plans do not exist within the governmental sphere of SA. The plans mentioned below are, however, considered key as they would help ensure more sustainable usage of ES and management of the ecosystems producing them.

National Strategy for Sustainable Development

The National Framework for Sustainable Development (NSSD) (DEA, 2011) was approved in 2011 by cabinet. It is a national level framework meant to guide the national vision, trends, priority areas and implementation of sustainable development. The aim is to do this through creating a robust institutional framework, action plan and by ensuring that everyone remains on board with the ideas set out in the NSSD (DEA, 2011). This framework aims to act as a pathway towards creating a national level coordinated sustainable development policy.

The NSSD has five strategic aims:

- Improve integrated planning and implementation.
- Use our ecosystems and resources sustainably.
- Invest in infrastructure and economic development that is sustainable.
- Create human settlements that are sustainable.
- Ensure appropriate response to evolving economic, environmental and human development challenges.

(DEA, 2011)

The NSSD (DEA, 2011) has some emergent ecosystems-focused planning elements as part of its objective to be a sustainable development guidance plan. For it to be implemented though, one would need to have champions at LM level that advocate for the abovementioned strategic aims to be incorporated in municipal planning processes. If combined with this one it would also need to have good data and information sets related to ecosystem elements, in order to effectively inform decision-making processes.

National Spatial Biodiversity Assessment (NSBA) 2011

The NSBA was developed in 2011 by SANBI (South African National Biodiversity Institute) in order to assess the state of SA's ecosystems and biodiversity, with a special focus on providing national level spatial information in the form of datasets and maps – it was the follow-up of the National Spatial Biodiversity Assessment done in 2004. The aim of the NBA 2011 was to bridge the gap between science and the policy arena in order to better inform decision makers.

The NSBA (Driver *et al.*, 2012: 23) states that it can be used to:

- Streamline environmental decision-making.
- Improve land use planning.
- Better inform general strategic planning processes regarding South Africa's development.
- Inform where ecosystem related management priorities are.

The NSBA is an extremely important document when considering the goal of creating an improved SES focused spatial picture at LM level as it creates very good ecosystems orientated datasets that can be utilised at local level in order to create a more ecosystems-aware spatial picture (Driver, *et al.*, 2012).

Limpopo Green Economy Plan (LGEP) 2013

The Limpopo Green Economy Plan (LGEP) aims for an ideologically sound development plan based on creating a sustainable and environmentally aware economic growth path for the province. It focuses on “*local production and consumption, efficient use of energy and water and care of natural and created resources;*” and claims to promote “*a new way of thinking, planning and living*” that “*provides socially and environmentally just solutions to economic exclusion and resource degradation*” (Letsoalo, 2013: 2). The main objective is still a socially driven one though, as it is to improve the human well-being of the people of Limpopo. The social drive is reflected in the fact that one of the plan's two main short-term goals is job generation (Letsoalo, 2013: 3).

The most encouraging aspect is though that throughout the short; medium; and long-term goals mentioned there are references to the importance of the environment. This plan created by the Limpopo Department of Economic Development, Environment and Tourism (LEDET) creates buy-in from environmental sectors because it acknowledges the sustainable development paradigm that focuses on doing away with traditional economic growth models in favour of a more inclusive approach that takes into consideration that the economy is nested in and dependent on socio-political and environmental scenarios, as can be seen in the figure 3.2 below.



Figure 3.2: Nested Nature of Development under the Sustainability Paradigm (Letsoalo, 2013: 5)

Not only does the acknowledgement of the integration of social; economic; and environmental spheres take place – the document also maps out the intergovernmental relations in tables in chapter 4, linking overall goals with specific government departments (local to national). This is a sound activity as it maps responsibilities and creates demonstrable targets. With effective and adaptive, continuous monitoring, management and evaluation this model could be successful. The LGEP does not have a strong spatial focus which means integrating it into local governmental spatial planning tools may be difficult. It will be essential to integrate at local level though, as it is a central and overarching framework plan that marries economic growth with the importance of managing natural resource usage effectively.

Limpopo Conservation Plan v2 2013

The purpose of the Limpopo Conservation Plan Version 2 (LCPv2) is to develop the spatial component of smaller scale Bioregional Plans (BRP's), as promulgated in NEMBA (RSA, 2004a; DEA, 2009: 9). The

LCPv2 is designed to support integrated development planning and sustainable development by identifying an efficient set of Critical Biodiversity Areas (CBA) that are required to meet biodiversity objectives, in a configuration that is least conflicting with other land uses and activities. Where alternatives are available, the Critical Biodiversity Areas are designed to avoid conflict with existing IDPs, EMFs and SDFs in the region by favouring the selection of sites that are least conflicting with other land uses (LEDET, 2013: 4).

According to Holness (2014), who developed the plan, it has not had official gazetted status in order to ensure that it has to be considered when development occurs that possibly influences ecosystems, although from the environmental compliance department of LEDET, confirmed they do use key LCPv2 features such as the CBA to inform their environmental authorisations (Rogers, 2015).

Olifants Letaba Environmental Management Framework (OLEMF), 2009

Environmental Management Frameworks (EMF) are developed under NEMA Section 24(3), with the regulations set around it provided in the NEMA Environmental Management Framework Regulations of 2010, with the aim to help guide decision-making processes which impacts on the natural environment. It is done through determining issues and priorities pertaining to the interface between development and the environment. The OLEMF was created in 2009, using a river catchment approach with regards to the spatial scale with the Olifants- and Letaba- River catchments acting as its boundary. Its aim was to ensure future developments are sustainable and to help with monitoring and controlling the environmental impacts of human activities (Environomics and MetroGIS, 2009: 1).

Of particular interest in the OLEMF is the Status Quo chapter (Environomics and MetroGIS, 2009: 1–46), which presents a solid overview of biodiversity elements as it offers a fine SES overview of the Olifants and Letaba catchment, with Maruleng lying fully within the Lower Olifants catchment. The SES overview does not discuss the interaction of the SES, but gives a worthy pillared overview of socio-economic components of the area, as well as ecosystem elements. This report is used throughout the VSTEOP Overview of Maruleng (chapter 4).

An issue with EMFs is that they do not have much bite with regards to enforcing any form of environmental approaches on a LM level, as it is intended to only provide an environmental guideline into developmental processes (DEA, 2010: 194). This unfortunately creates a scenario where none of its key elements, such as the very useful Environmental Management Zones in the OLEMF (2009: 47),

which earmarks certain areas for certain types of development, is mandated in any way to be absorbed into LM or other planning processes.

Mopani Bioregional Plan

Bioregional Plans (BRP's), as authorised under NEMBA, are one of a range of tools, such as the EMF discussed above, that can be used to facilitate biodiversity conservation. BRP is developed to inform land-use planning, environmental assessment and authorisations, and natural resource management, as well as all governmental sectors where policies and decisions impact on biodiversity (RSA, 2004a: 42). The key component with which this is done, is a map of biodiversity priority areas, or Critical Biodiversity Areas (CBA), together with accompanying land-use planning and decision-making guidelines. The conservation plan applies a systematic spatial biodiversity planning methodology to develop this map, with inputs from the best available biodiversity data. The map, as derived from certain variables, represents the minimum area necessary to maintain biodiversity patterns and ecological processes in the landscape, i.e. functioning ecosystems in a healthy enough state to provide ES (LEDET., 2013).

BRP's are developed to inform a range of multi-sectoral planning and assessment processes (i.e. EMF, SDF, Strategic Environmental Assessments (SEAs) and Environmental Impact Assessments (EIAs)), as well as having the aim to streamline environmentally focused decision-making processes. A BRP is not in itself a multi-sectoral planning, or assessment tool, but rather is the biodiversity sector's input into other planning and assessment processes (DEA, 2009: 9).

According to Kruger (2015), LEDET prioritised the development of Bioregional Plans for each of their districts, with the Mopani BRP being the first one that was planned to be, and was, gazetted in January 2019. With the Maruleng LM case study area being part of Mopani District (LEDET, 2015), it provides a great opportunity to increase the availability of detailed ecosystems data for usage in municipal spatial planning and development processes in Maruleng because of the BRPs nature of being spatially orientated.

Kruger to Canyon Biosphere (K2C) Environmental Management Plan

The Kruger to Canyon Biosphere (K2C) is the third largest biosphere in the world, covering some 4.8 million hectares – Maruleng falls squarely within it. The Biosphere ranges all along the western Kruger National Park border from around the Phalaborwa region in the north to Bushbuckridge in the south, going as far west as the escarpment. The K2C is mandated through the United Nations Educational,

Scientific and Cultural Organisation) (UNESCO) Man and Biosphere initiative and has been up and running since 2001 (UNESCO, 2014: 1). The K2C implements socio-environmental programmes focused on improving the natural resource usage and stewardship of the environment. This is focused specifically on rural communities. Other engagements include student exchanges and workshops on improved natural resource management; collaboration with organisations such as SANParks, the Greater Limpopo Transfrontier Conservation Area and several private land owners in order to promote environmentally friendly land use management practices through facilitating workshops and forums (UNESCO, 2014: 7). The K2C also, most importantly, works closely with all the different spheres of government (local up to national). They are especially active as strategic partners for the Maruleng Municipality, according to the K2C Chief Executive Officer, Uys (2014).

As part of the K2C's work on improved management and stewardship of land it developed the K2C Environmental Management Plan in 2013. It is legislatively seen as an EMF (similar to the OLEMF described above). The document describes proposed activities for the different spatially defined zones within the K2C. There are three Zone types, namely the Core Zone, Buffer Zone and Transition Zone, with the levels of proposed development and intensity of land use patterns suggested to be the least in the Core and most regular in the Transition Zone (Diphoro Development and LEDET, 2013: 38). The K2C and the level of governmental buy-in it has, makes it a key partner with which to engage if an ecosystems approach is to be implemented into spatial land use planning and management at the Maruleng Municipality.

3.4 INCORPORATING AN ECOSYSTEMS FOCUS INTO LOCAL MUNICIPALITY SPATIAL LAND USE PLANNING

Now that an overview has been provided of the current spatial land use planning and environmental legislative and institutional frameworks for South Africa, this section will look at how to best bring spatial planning at LM level and environmental planning processes together in order to create spatial land use planning at LM level that adequately address ecosystem elements. According to Kotschy (2014: 13) the urban ecology research field has moved towards the inclusion of biodiversity in spatial planning processes in recent ventures. This is backed up by the abovementioned literature showing a clear legislative reform process undertaken by the South African government in order to improve the environmental focus taking place during developmental activities. Concepts such as sustainable development and environmental management have since the start of democracy become more prominent within the South African governmental sphere through the various pieces of legislation and

strategic plans discussed above. The trickle-down effect of these concepts into the local governmental sphere has, however, been extremely limited (Ruwanza and Shackleton, 2015: 2).

There is a substantial amount of research and governmental implementation work focused on the inclusion of broader environmental features at local governmental level. There is, however, according to Vromans (2015: 28), still a huge gap to date with regards to research done on the specific topic of taking an ecosystems approach to environmental planning at municipal level, though broader environmental inclusion research is becoming more regular. This inherently implies as well that the implementation of such approaches by local governmental organisations will be almost none-existent when considering the findings of Ruwanza and Shackleton (2015: 2).

The sections below will focus on the municipal processes/tools seen as key to help achieve a stronger ecosystem focus in the local governmental sphere. Ecosystems-based planning is a specific subset of environmental planning and management processes. With research concluding a lack of a basic environmental focus at municipal level, the assumption is made that it is highly unlikely that the more specified subset of ecosystems planning will feature. The analysis of the key municipal tools will therefore focus on environmental elements and how regularly they are included rather than only strictly focusing on ecosystems. Underlying ecosystems-related thought patterns arising from the documents and potential areas to make it stronger will be noted.

3.5 KEY MUNICIPAL LEVERS WITH WHICH TO PROMOTE A STRONG ECOSYSTEMS FOCUS IN SPATIAL LAND USE PLANNING

3.5.1 Integrated Development Planning (IDP)

The Integrated Development Plan (IDP) and its associated processes are undertaken by municipalities to formulate a goal orientated strategic development strategy and identify key projects to help achieve said goals. It serves as a management tool with the aim of enabling the municipality to help address all key issues holistically by means of determining the overall strategic vision and development requirements (Coetzee *et al.*, 2001: 4-5). The IDP emanating from this process is the primary planning document that emerges. It informs and directs all the planning, budgeting, management and decision-making processes of a municipality.

The IDP should guide:

- Identification of priorities for development.
- Formulation of visions, missions and values.

- Formulation of applicable strategies, organisational systems and structures in order to achieve the abovementioned visions, missions and values.
- The aligning of available resources with development priorities.

The creation of an IDP is set out in the Municipal Systems Act (MSA) (Act No 32 of 2000) (RSA, 2000). In support of an IDP there is some core auxiliary components to be developed, as per Section 26 of the MSA (RSA, 2000: 38). These components can be seen in the figure 3.3 below.



Figure 3.3: Components of an IDP (RSA, 2000: 39)

The MSA (RSA, 2000: 14) stating under the Definitions section that for the purpose of the Act, development can be defined as “*sustainable development and includes integrated social, economic, environmental, spatial, infrastructural, institutional, organisational and human resources upliftment of a community.*” This definition would lead to the belief that one of the auxiliary components of the IDP should therefore have been focussed exclusively on the environment. This, however, is not the case, with the only reference to the environment being that IDPs include mandatory sections of environmental analyses in their Analysis phase, which is in general quite emaciated (Ba-Phalaborwa Local Municipality, 2013: 12; Bushbuckridge Local Municipality, 2012: 46; Coetzee *et al.*, 2001: 48; Maruleng Municipality, 2014: 36; Vromans, 2015: 22). There is thus a lack of will and/or resources at local government planning level to acknowledge the importance of the environment and its

contribution to HWB. With a lack of legislation to force a stronger environmental focus in the IDP neither the stick through legislative enforcement nor the carrot is present as incentivising mechanism to include a stronger environmental focus in municipal IDP planning. There is, however, an opportunity for an improved environmental focus through the Spatial Development Frameworks which feed into the IDP process – therefore a strong focus will be placed on it as spatial planning tool, and its ability to be a holding place for ecosystems-focussed planning processes. Below there will be a limited analysis of Maruleng’s IDP in order to see if, as part of the case study, it holds any ecosystems-related planning and possible opportunities for inclusion.

3.5.1.1 Maruleng IDP

The IDP is a living document that should get renewed on a yearly basis. Maruleng’s first IDP dates back to 2006/7. Since then there have been eight other ones up until 2018 (also counting the 2018 Draft IDP). Below is a brief analysis of the oldest (2006/7), mid-term (2014/15) and 2011/12 IDP (as more or less a median between the two) as well as the latest IDP:

- **2006/7 IDP:** The first IDP produced for Maruleng is quite a limited document compared to the IDPs that it acted as forerunner for, having a lot less detailed analysis phase. It states that the vision of the municipality is *“To be the powerhouse of socio-economic development through integrated (and sustainable added here in the 2011 IDP (2010: 9)) agriculture and tourism”*. The mission of the 2006/2007 IDP (2006: 9) states that *“Maruleng Local Municipality is committed to the provision of basic services and the promotion of socio-economic development in an integrated and sustainable manner”*.
- **2011/12 IDP:** This document is fairly substantial in size compared to the 2006/2007 IDP, covering some key features in much more detail, with the analysis of information also being better than that of the previous one. Their motto is *‘Wildlife Haven’* as, according to the IDP (2011: 10). This is of particular importance because it shows growing awareness by the municipality that the Maruleng area is a wildlife and associated tourism-hotspot (due to its well-kept natural areas able to deliver this form of ES).
- **2014/15 IDP:** By the third IDP reviewed it became clear that much information was simply brought forward from previous ones without noteworthy change. A concerning issue is that many projects that were undertaken in the previous IDP analysed, are also listed in the current IDP. This could either mean that they are long term projects or that these projects are not being done, with the prior being more plausible as it was an issue raised in two IDP Public Participation Process meetings attended (Maruleng Municipality, 2014b; 2014c).
- **2018/9 IDP:** The last IDP assessed shows a shift in the focus of the IDP to strongly include agriculture as the primary economic drivers of socio-economic development. This entrenches

the fact that if Maruleng was to succeed it would need to look after the ecosystems providing the services on which agriculture and tourism is directly dependant. The IDP does however not create a direct link through allocating a stronger focus on environmental management, nor does it budget for projects linking to securing ecosystems (Maruleng Municipality, 2017).

Environmental Focus in Maruleng IDPs

The 2006/7 IDP had minimal inputs and goals with regards to ecosystems and improved environmental management. It had ten overarching objective categories, of which one was environmentally focused, but also only to the extent of having one aim, “to reduce environmental pollution by 10% per annum” (Maruleng Municipality, 2006: 33). More concerning was Table 7: Potential Projects for Maruleng: Municipal Perspective (Maruleng Municipality, 2006: 44), which created a wish list of projects to be undertaken to serve as an indicator for achievement of objectives. Of the 119 projects earmarked, 5 focused on the environment, particularly waste management. Moreover, in the municipal overview chapter (9 IDP 2007 MLM) there is no focus on providing an environmental context.

Similar to 2006/7, IDP has set out 12 sector plans in the form of plans, schemes and policies. These include: a SDF; a Land Use Management Scheme; a Local Economic Development Plan; an Integrated Waste Management Plan; an HIV and AIDS Plan; a Skills Development Plan; an Employment Equity Plan; a Housing Chapter; a Strategic Audit Plan; a Risk Management Policy; a Draft Anti-Corruption Policy and a Performance Management Policy. Again, of the 12 plans guiding the IDP and thus the municipality – just like with the 2006/2007 IDP – no environmental focus could be found. The IDP does have an environmental analysis section under the SDF discussion although it covers only one page of the entire 158-page document. It is encouraging to note that under the Priorities of Maruleng section it is stated that the development of an Environmental Management Plan is important to help address “severe environmental effects/problems” (Maruleng Municipality, 2010: 66).

The 2014/15 IDP’s Environmental Analysis under chapter 3: Situational Analysis is an exact copy of the one done for the 2011 IDP Environmental Analysis. The only difference is the addition of two sentences on the climate of Maruleng and three highly generalised sentences on global warming, in which the Lowveld floods of 2011/12 are mentioned (Maruleng Municipality, 2014a: 36; 2010: 42). A superficial Social and Environmental SWOT analysis is done for the Maruleng Municipality (2014a: 42) yet no environmental aspect is mentioned in neither the Strengths, Weaknesses, Opportunities nor Threat sections. The two abovementioned factors, combined with the Environmental Management Plan that was earmarked in 2011 for development and still being earmarked for development in the 2014/15, IDP creates the idea that the environment and planning for better management thereof, is

on the back burner at MLM. The Kruger to Canyons Biosphere, which focuses on improved environmental management in the Maruleng area and further, is, however, encouragingly earmarked in the IDP's budget for support to the extent of R509440.96 over the time period 2014/15–2016/7 (Maruleng Municipality, 2014a: 124). This is good progress with regards to ensuring improved environmental management in the municipality, however, it is only an auxiliary feature that will not see a strong ecosystems approach embedded in the municipality and its strategic planning processes. This pattern repeats itself in the 2018/9 IDP, with no focus on environmental projects that would secure valuable ecosystems and the services they produce.

3.5.2 The Spatial Development Framework (SDF)

3.5.2.1 What is a SDF?

Spatial Development Frameworks (SDF) are part of the planning processes (needing to be) done by all local municipalities in South Africa under the MSA (RSA, 2000: 38). It is seen as an essential part of the planning process of local municipalities, as it acts as a guiding tool to help ensure effective planning, development and management of the spatial features within the specific municipal area. An SDF is the document that guides overall spatial distribution planning and land use management decision-making processes, in order to lend effect to the vision, goals and objectives of the municipality that created it. It should also be aligned with other municipal sector plans and strategies to ensure the desired spatial form and outcomes planned by the municipality are achieved. An SDF has, by nature, a broad scope as it is seen as an overarching document drawing together sectors of a municipality's development planning and therefore needs to be used in close conjunction with other sector plans to bridge the gap between only being a conceptual guidance framework and actually being implemented at ground level.

3.5.2.2 Purpose of an SDF

The main purposes of an SDF can be summarised in the following few generic points, although each SDF is case specific:

- Act as a document that guides the municipality towards achieving its desired spatial structure, as informed by the aims and objectives of the particular local municipality and other spheres of government.
- Act as guidance tool for the local municipality's IDP, to help ensure effective spatial planning that addresses the needs and issues brought forward by it.
- Guide and align developmentally focussed investments. This includes private business development opportunities, as well as governmental service delivery projects and infrastructure investments.

- Create a more systematic way of planning for spatial development to ensure that development is truly assessed on its spatial outcomes and effects (for example creating a new industrial zone 20km from the nearest residential area would be aesthetically pleasing, but create transport issues, as well as going against the idea of creating compact urban areas – building it next to a residential area may decrease land value and be an environmental hazard to the neighbourhood, but it will decrease travel costs and promote urban area compaction, freeing up land for other purposes).
- SDFs should also be used as guideline tools to address the major issues highlighted by national plans such as, for instance, the six pillars of the National Spatial Development Perspective released in 2006. These pillars, for example, overlap with the NDP for 2030 and they highlight addressing key issues such as the spatial inequality created by Apartheid (Principle 5 of NSDP 2006); and promoting infrastructure and spatial development that ensures sustainable rapid economic growth to alleviate poverty.
- Serve as a high-level framework that should inform more detailed land use planning tools such as Land Use Management Schemes.

(City of Cape Town, 2012: 2 and Ethekeweni Municipality, 2014: 8)

3.5.2.3 General principles of effective Spatial Planning and Land Use Management

The following principles flow from national legislation (particularly the SPLUMA, (RSA, 2013) and the Simplified Spatial Development Guidelines (Department of Rural Development and Land Reform, 2011) and international and national best practice for successful spatial land use planning and management:

- Promotion of public interests should prevail over that of private interests, with well principled spatial planning ensuring that the broader, integrated picture informs decision-making.
- Good spatial planning promotes the equal beneficitation of all its residents, not allowing for discrimination and promoting equal rights to all.
- Promoting environmental health through reducing the area's ecological damage.
- The adoption of a precautionary approach towards the usage of resources in an attempt to promote sustainable development that mitigates negative development effects.
- The encouragement of connectivity from international down to local level.
- The improvement of urban efficiency through aligning planned growth with infrastructure provision.
- Offering access to the area's economic opportunities, resources and amenities for all
- Redressing the spatial imbalances of the Apartheid era.

- Responsiveness to the basic needs of communities by providing a stronger link between regulatory processes (zoning schemes) and spatial plans and policies.
- Promotion of cross-sectoral planning, budgeting and growth management.

The abovementioned are the general ideas surrounding effective spatial planning and should be seen as guiding principles illuminating key issues needing to be addressed in municipal spatial planning and land use management tools. The next section will use the abovementioned principles in order to analyse Maruleng's SDF and LUMS. A broad-brush analysis will be done for all, whereafter specific attention will be turned to the inclusion of environmental elements in the documents.

3.5.2.4 Maruleng SDF

Maruleng has produced two SDFs (their SDF of 2007 and the SDF of 2014). Below these two will be analysed briefly in order to create a picture of the integrity of the documents, the trajectory they lay out for the municipality and what type of approaches were taken towards achieving goals:

2007 SDF: This SDF is well aligned with the 2006/2007 Maruleng IDP with regards to spatial prioritisation, alignment of principles and development strategies. There is strong focus on the strategies that the municipality was using at that time in order to achieve its goals, as well as a strong focus on integration of the various plans existing within the municipality (C-plan Development Consultants, 2007: 81; 54). This focus on alignment is important as a method of avoiding fragmentation by focusing on cohesion in the process of working towards collective goals. The document does, however, unfortunately contain a very limited spatial analysis, which makes it difficult to create a truly informed spatial understanding of the area.

2014 SDF: The aim of the 2014 SDF update for Maruleng was to align the spatial planning processes of the municipality with the requirements of SPLUMA (Plan Associates, 2014: 8). The SDF achieves that through a strong focus on meeting the requirements set out in SPLUMA (Act No.16 of 2013) (RSA, 2013) chapter 4 Part E which states what the content of a municipal framework should be. The SDF has a strong focus on not only Maruleng but also the broader area through very briefly describing adjacent municipalities (Plan Associates, 2014: 28), which could be seen as a sign of systemic thinking. As with the 2007 SDF a strong focus is again placed on alignment of the SDF with other municipal documents such as not only Maruleng's Local Economic Development (LED) strategy and IDP, but also that of Mopani. This document is much more substantive than in 2007 SDF and exhibits much growth, being more rounded due to the SPLUMA guidelines which are much more explicit on what comprises a functional SDF than what was contained within the MSA chapter 5 (RSA, 2000) under which the 2007 SDF was developed.

Environmental focus in Maruleng SDFs

The 2007 SDF, as mentioned above, was a very rudimentary document due to it being the first one developed for Maruleng. Although not containing explicit maps of elements such as Critical Biodiversity Areas (only developed for Limpopo in 2013 through the Limpopo Conservation Plan V2), it contains a thorough but brief narrative on environmental protection (C-plan Development Consultants, 2007: 42). Very importantly, although not labelling it as ES, the SDF creates a link between tourism and the importance of protecting the environment due to the economic spin-offs it provides the people of the area (C-plan Development Consultants, 2007: 44). The emergence of the availability of ecosystems-related information and the lack of clear guidance on what should have been contained within SDFs does make the fact that this document had a limited environmental focus slightly more digestible.

The 2014 SDF contains a more substantial focus on environmental elements in its overview of the municipality, including elements such as Critical Biodiversity Areas and Protected Areas, as well as having a strong focus on the role the Kruger to Canyons Biosphere should play in promotion of improved environmental management (Plan Associates, 2014: 36). The incorporation of some key environmental layers in the SDF was facilitated by AWARD, who as part of their RESILIM O project and through acting as strategic partners in the development process of the SDF, provided key environmental information to the SDF developing consultant (Holness *et al.*, 2014:1–26). Also, very encouraging is that, as part of the listed Priority Projects for Maruleng, under Development Objective 1: Environment, five projects are listed that focusses on implementing projects as informed by the information emerging from SDF and IDP planning processes (Plan Associates, 2014: 91). It is, however, not reflected in their IDP of 2014/15 showing a disjunct in strategic planning alignment practices.

With the two SDFs produced by Maruleng falling in different legislative timeframes (the 2007 SDF under the MSA 2000 and the 2014 SDF under SPLUMA 2013), the latter has a lot more explicit guidelines to work from. There is thus an increase in the uptake of environmental features, but it can be rationalised that it is due to being mandated by SPLUMA Section 7 (b) (iii); 12 (1) (m) and 21 (A) (j); and not because the municipality realises how important a healthy environment is for continued provision of ES, and the benefit it provides to the people of Maruleng.

3.5.3 The Land Use Management Scheme (LUMS)

The LUMS is a key spatial development tool at local municipal level, and a major intervention point in the system towards achieving adaptive spatial planning that will promote more resilient ecosystems.

The LUMS can be seen as a control-focused implementation phase document acting as the direct land use zoning regulating tool that is informed by the SDF, which is more of a planning tool (Charlton, 2008: 7). It is used to divide land into different use zones, activities and densities, as planned for and managed by municipalities. The aim of a LUMS is thus to coordinate and regulate all forms of land use in a systematic way through assessing how and where optimal land use practices can occur that aligns with the vision and mission of the municipality that developed the scheme.

Land use planning, utilising the LUMS has two directives, ensuring effective development planning and also applying development control as informed by a municipality's aims and objectives (KwaZulu-Natal Planning and Development Commission, 2010: 16). Development planning is done to guide emergent development patterns through taking into consideration elements such as access to basic services, economic activities, the physical environment and public interest. Development control focuses on the implementation of what has been planned (in the LUMS itself, in the SDF, as well as other documents such as the IDP and LED (Local Economic Development Strategy). It stipulates where planning can and should occur. This focuses on how land is zoned, its subdivision and development approval, or denial according to the terms and conditions set out in the titles of land portions.

3.5.3.1 Purpose of LUMS

According to the LUMS of Govan Mbeki Local Municipality (Sisonke Development Planners, 2010: 8-11), Bushbuckridge Local Municipality (2014: 1) and a LUMS Research Report (KwaZulu-Natal Planning and Development Commission, 2010: 23), there are 14 broad aims for a scheme – of these the top eight are listed below:

- Provide a single, user-friendly mechanism applicable to all land whereby land use rights are obtained, held and regulated.
- Be flexible in content and administration to provide for different local circumstances.
- Encourage private sector initiative and pro-active cooperation between the private sector and the Municipality.
- Balance the more stagnant Municipal planning functions with the greater dynamic market-driven investment and development.
- Provide greater integration and linking of the traditional municipal planning functions of land use control and forward planning.
- Provide a mechanism whereby desirable development – as foreseen in the IDP – can be facilitated in the Municipality.
- Provide for development incentives and/or disincentives.
- Provide a mechanism whereby national policy directives can be implemented.

A LUMS should include maps, definitions, land use policies, land use districts, zones and management areas. These all aim to address the purposes as outlined above, with all this data needing to be held in a central database which is utilised to help inform land use applications (SALGA *et al.*, 2011: 2).

The LUMS is important to include in spatial land use focused ecosystems-based planning and management due to its legally binding mandate. Having it properly zone environmental areas would be most beneficial to the aim of allowing for systemic protection of key ecosystems and the ES they provide (Kaczorowska *et al.*, 2015: 1). Similar to the abovementioned process for the IDP and SDF, the Maruleng LUMS will be discussed below.

3.5.3.2 Maruleng LUMS

To date only one LUMS has been drafted for Maruleng Municipality. It was done in 2008 (Maruleng Municipality, 2008). The document is very basic when compared to other Schemes (Govan Mbeki and Bushbuckridge Municipalities). This could rationally be explained by the fact that it is around 10 years old, as well as being the first Scheme developed by Maruleng. Traditional documents such as the LUMS, SDFs and IDPs are developed by consultants and much is dependent on these consultants and their abilities to produce effective documents. Another influence is that in 2008, with the development of this document, no clear guidelines, as such, existed (as for example the 2011 Municipal Planning Brochure produced by SALGA). The Development Facilitation Act (67 of 1995) (RSA, 1995) which defined zoning schemes at that stage also (from which LUMS developed) had limited guidelines and standards. This has changed recently, with chapter 5 of SPLUMA (No. 16 of 2013) (RSA, 2013) focusing solely on Land Use Management and Land Use Schemes, taking over from the previous Act and having very clear standards set out for the development of a LUMS. It includes:

- What a Scheme should be.
- Its purpose and contents.
- What legal effects it holds.
- How reviewing, amendment and monitoring should happen.
- What consultative processes need to be followed during its' development.
- How authorisations should be aligned and records kept.
- Enforcement of a Scheme.

(SPLUMA, 2013: 34)

With the induction of the new SDF for Maruleng, focus will be shifted to finalising the LUMS. The SPLUMA (RSA, 2013) legislation also states that from its enactment to when full compliance is expected, should take five years (SALGA CEO, 2014: 2). This means that an update of the current LUMS

is mandated (under SPLUMA chapter 5: Land Use Management) to happen before August 2018. It was not gazetted by the cut off for this study (end 2018). It would be ideal if this document could nudge Maruleng towards the new ecosystemsfocussed paradigm through actively playing a role in ensuring that development planning occurs in conjunction with a focus on ensuring healthy ecosystems persist, in order to provide maximum ES benefits to the people of the area. The LUMS is a great tool with which to achieve this as it helps control land use and can determine the level of development in certain areas. With good levels of knowledge available, the key ecosystems and the ES they provide, can be protected by zoning them as areas earmarked for being preserved in a natural state (Kaczorowska *et al.*, 2015: 1).

Environmental focus in Maruleng LUMS

The LUMS is seen as a tool that could be of assistance with the enforcement of more ecosystems-focused land use and spatial planning. The Maruleng LUMS has a strong environmental focus, unexpected when drawing similarities between it and the environmental focus in the planning documents (2007 Maruleng SDF and IDP 2006/7) acting as the overarching planning tools which would have had to inform it. As a general principle applicable to all land use there is a clause in the LUMS (Maruleng Municipality, 2008: 24) stating that land and the environment may not be damaged by any zonation and that no development may occur that does not comply with NEMA (RSA, 1998a).

Maruleng LUMS has 27 Land Use Zonation types, of which only two are focused on developmental control that could possibly promote ecosystems well-being. The other 25 zoning types are all focused on development. The two types of areas that could promote ecosystems' health are Open Space zones, including parks, gardens, camping sites, recreational areas and other forms of zones that could provide key cultural ES to the people of the Maruleng Municipality (Maruleng Municipality 2008: 29 – 35). The other zoning type is Protected Areas – these are all declared reserves (national, provincial and private). This type of zone has a strong development control focus through the legislation under which the areas were declared. The various pieces of legislation include the National Environmental Protected Areas Act (No 57 of 2003) (RSA, 2003), the Limpopo Environmental Management Act (6 of 2003) (RSA, 2003) and various older ordinances such as the Transvaal Nature Conservation Ordinance (No 12 of 1983) (RSA, 1983) (Paterson, 2009: 46–47). Although only two Land Use Zonation types could possibly contribute to healthy ecosystems, the protected areas zoning is highly prevalent in the spatial footprint of Maruleng (Holness *et al.*, 2014: 7) – as will be discussed in the VSTEOP overview chapter.

3.6 KEY INSTITUTIONAL ROLE PLAYERS

Today, mostly implementation, but also to some extent planning around the broad environmental sector in South Africa is influenced by a strongly heterogenic group of role players (Muller 2007: 45). The approach taken from the onset of democracy in South Africa promotes a bottom up focus which allows for a multiplicity of institutions to play a role. Below is a list of institutions involved in environmentally focused planning and implementation processes that could help promote a stronger ecosystems focus in spatial land use planning. As part of the case study approach, an example of each one involved in and important to the Maruleng Municipality area will be provided. The list was derived from Muller (2007: 45-58), and expanded on as deemed necessary for the context of the Maruleng case study:

- Governmental Sector:
 - National departments: Department of Environmental Affairs involved in a Working for Land initiative in the western area of Maruleng Municipality.
 - Provincial departments: Limpopo Economic Development, Environment and Tourism Department involved through the development of Bioregional Plans, as well as environmental compliance which should be related to what is mentioned in municipal planning processes.
- Parastatals:
 - SANBI providing – through studies such as the NBA 2011 – valuable information to be drawn into municipal planning, as well as providing general biodiversity mainstreaming tools such as their online GIS website, B-GIS, that offer biodiversity information specific to each municipality in South Africa in various forms (spatial (GIS) datasets, visual displays and written documents).
 - South African National Parks which has a Kruger National Park Buffer Zone Strategy focused on land use planning – is important for Maruleng to take into consideration when developing their SDF and LUMS because of being situated within the buffer zone.
- Private Sector: With all forms of land use needing to comply with municipal plans, farmers, private protected areas and all private sector developers need to ensure they operate within the spatial and ecological limits set out.
- Civil Society Sector.
- NGOs who are beginning to play a more prominent role in providing support to other sectors and working on ground level on environmental governance issues. The Association for Water and Rural Development (AWARD) is an example of a NGO running a multi-million dollar project (RESILIM O Project) which is internationally funded, and focused on improved biodiversity, climate change and water management within the Olifants River Catchment (in which Maruleng lies). The project is funded by USAID, lasting from 2013 to 2017.

- Internationally mandated (United Nations) organisations such as the Kruger to Canyon Biosphere playing a role in biodiversity planning through its biosphere footprint zoning and natural resource management programmes.
- Privately Funded Organisations, such as the Blue Canyon Conservancy in Maruleng, which is a consortium of wildlife estates, game farms and protected areas, having a big effect on the land use planning and management taking place over a large part of Maruleng.
- Traditional Authorities such as the Sekororo Tribal Authority in Maruleng, custodian of traditional areas (together with the Maruleng Municipality) in the northwest of Maruleng, and thus plays a role in governing environmental matters in that area.
- Local stakeholders, who as a collective, play a role in environmental governance through the land which they manage, as well as being able to participate in municipal planning processes.

Spatial land use planning legislatively occurs within the governmental sphere with civil society able to provide inputs. Land use management and the implementation, on the other hand, is the responsibility of the heterogeneous group described above. Effective planning will only go as far as providing a framework from which to try and ensure that controlled management of the land becomes reality. The abovementioned group will be of importance to involve in order to ensure that what happens at municipal planning level is implemented, in order to ensure that healthier ecosystems prevail.

3.7 CONCLUSION

This chapter has focused on creating clearer understanding of the institutional arrangements existing around spatial land use planning and environmental planning that could help promote a stronger ecosystems approach to land use spatial planning at a municipal level. The figure below portrays the key spatial land use planning and environmental planning tools and legislations, as well as indicating potential key role-players that should be involved in promoting a stronger ecosystems focus in the Maruleng Local Municipality.

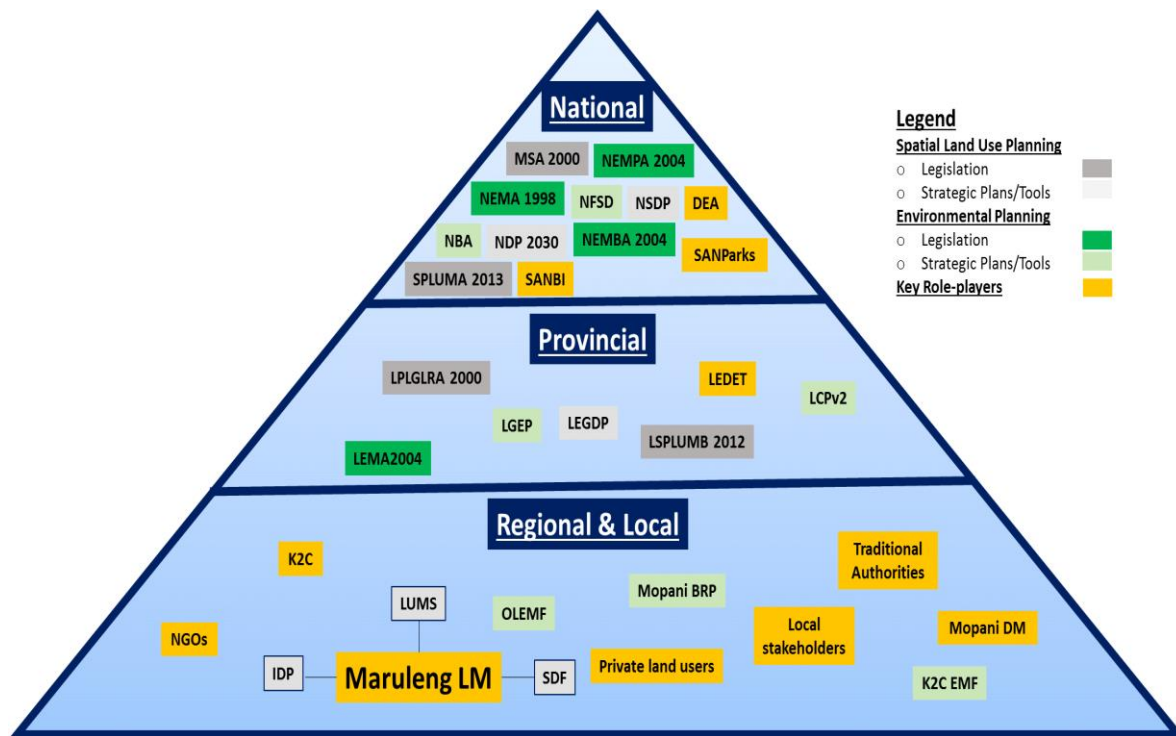


Figure 3.4: Land Use and Environment Institutional Framework (Researcher, 2019)

There now exists a good understanding of how to go about institutionally ensuring better planning and management of ecosystems from a spatial land use perspective. This is important as it creates a clear understanding of the role players, what drives and guides their approaches, how they can and should be involved and what would be the best angle with which to approach them. The institutional overview indicated that there is a chronic lack of ecosystems focused planning, but that there are some clear environmental planning tools which can be utilised, such as the EMF and BRP. It also suggested that legislation be included in municipal spatial land use planning and management instruments such as the SDF and LUMS.

CHAPTER 4: CONTEXTUAL ANALYSIS OF THE VALUE, SOCIAL, TECHNOLOGICAL, ECONOMIC, ENVIRONMENTAL AND POLITICAL FEATURES (VSTEED OVERVIEW) OF THE MARULENG MUNICIPAL AREA

4.1 INTRODUCTION

This VSTEED overview of Maruleng is centrally based on the focus of how to make ecosystems planning more explicit within the integrated spatial land use planning processes of Maruleng Municipality, with specific focus on adopting a systemic approach that would identify the complexity and interconnectedness of the major drivers in the area. Systemically looking at the area is seen as an important component that would ensure that the Socio-Ecological System is well understood as a whole. The Maruleng IDP, SDF and LUMS analysis in the previous chapter indicated a substantial gap in terms of a systemic overview and understanding of the area. With the focus being on ecosystems and the ES they provide, this section will explore the systemic drivers in the area, with a specific focus being placed on understanding the ecosystems of the area. There is a very strong focus on using the ES lens, to specifically show the connection between the social and ecological sides of the system. It is also utilised because it is seen as the angle that would most likely be able to create improved awareness of how important healthy ecosystems are to the livelihoods of the people residing within the Maruleng Municipality area, thus needing to be incorporated more vigorously within the spatial land planning process of the municipality. The VSTEED approach is used to promote a SES view in this chapter as it is seen as a framework that ensures that all parts of the SES, as well as its interconnectedness, is described and understood. This chapter covers the Value, Social, Technological, Economic, Environmental, and Political features of the Maruleng area in an attempt to create the context in which the main drivers present in the area will influence the ability to ensure integrated spatial planning occurs that allows for healthy ecosystems to produce the ES required to promote improved HWB.

4.2 VALUES

The values encapsulating an area, unlike the other VSTEED aspects, is based on the opinion of the people residing within the research area. It is a part of the contextualisation process that is hard to pin down and measure because it is a qualitative aspect and therefore has not been used widely. It is important to understand though, because as one does research on the other VSTEED aspects some underlying values emerge, and understanding where these come from is important. The core values present in an area are important to understand as a connector of different elements in the broader

SES context as they frequently determine how interaction will occur between people and the environment they engage with.

To understand the Value systems existing in the Maruleng area a VSTEOP public participation process was facilitated by AWARD in Hoedspruit (the hub of Maruleng) for the RESILIM O project. At the meeting people were asked to list the most prominent values they experienced in the area. Below is a box with the main values that emerged (the most regularly mentioned and important ones for the purpose of this study are highlighted in blue in table 4. 1. Their relevance and what drives them will be briefly discussed in an integrated way below. As a supplement to the VSTEOP public participation process, several interviews were done with people in the area as well to further supplement the public participation process.

Table 4.1: Hoedspruit VSTEOP Public Participation Meeting (AWARD, 2014a: 7)

Values		
Equity	Knowledge and Understanding	Power issues
Ownership	Awareness	Sustainability
Respect	Patriotism	State of flux
Responsibility	Sense of entitlement	Participation
Self-preservation	Opportunities	Trust
Self-enrichment	Appreciation of basic survival	Legacy

The value of the environment as a primary support tool for people's livelihoods and how they utilise and value this in its role as beneficence mechanism, is one of the most important focus points for this thesis, as it is a good indication of how the people of the area will go about utilising the ecosystem services the area provides. The natural environment, as a direct source of beneficence to primary economic sectors in the area, is extremely important, as the most prominent users here are also the less resilient, poorer people. Interviews done with the Environmental Monitors (2014) and Malepe (2014) from the K2C indicated clearly that these people are strongly influenced by the basic need for survival. As understood from the interviews this value tends to create a situation where people use ecosystem services without consideration of sustainability. Theoretically, if one considers Maslow's Hierarchy of Needs (1954: 234)⁵ it is understandable, as basic physiological survival rates are a more important element of existence than the self-realisation that would be gained from better

⁵ Maslow's hierarchy of needs is often portrayed in the shape of a pyramid with the largest, most fundamental levels of needs at the bottom (physiological) and the need for self-actualization at the top, it is explained as the bottom needs needing to be fulfilled before one can move on to achieve higher needs.

management of the natural environment. Better management of the natural environment and the ecosystem services it provides the people of Maruleng is, however, fortunately emergent with several natural resource-use programmes run in the area in an attempt to help the people directly dependant on natural resources use it more sustainably (Diphororo Development and LEDET, 2013: 16; Malepe, 2014 and Uys, 2014). As explained in the institutional sector, there are very prominent role players, such as the Kruger 2 Canyons Biosphere that works hard towards promoting this general push for the value of sustainability to become more prominent when utilisation of ecosystem services occur. This also works to counter the self-enrichment value highlighted above, which similarly to 'a sense of basic survival', generally leads to over exploitation of ecosystem services. Both these values are mentioned as they are a major obstacle to the implementation of improved ecosystem approaches in spatial land use planning. This is a consequence because it creates a scenario where disregard of these planning processes and the legislation put in place to help give these planning processes some bite, happens in order to promote survival/self-enrichment. When looking at systems complexity and resilience, this over consumption and degradation happening through smaller parts, will in the end reduce the resilience of the overall system negatively (Folke *et al.*, 2010: 4).

One of the other dominant negative values that emerged from the VSTEOP public participation process was the scenario around equity. The fact that poor communities suffered in the past due to conservation attempts through for instance forced removals to free up land for conservation, still encapsulates the deeply held value and belief system some have around natural resources utilisation and ecosystem service beneficiation. This belief is that conservation of natural resources comes at a price for poor people, and that it excludes those that are directly dependant on it, thus only benefiting those with the monetary means to enjoy it. This issue around equity limits the buy-in of poorer communities to better spatial planning, land use and natural resource management practices. An example of this that emerged at the VSTEOP public participation meeting (AWARD, 2014b: 12) was the issue that upstream pollution of rivers such as the Olifants from mines and other sources of rivers causes negative effects on ecosystem service delivery downstream, most harshly effecting less resilient, poor communities who are more directly dependant on natural resources. The fact that it is harder to create buy-in into better spatial planning and management that promotes better ES management from these communities (about 88% of the population of Maruleng [StatsSA, Census 2011a-d and Statistics South Africa, 2012: 32]), creates a major obstacle to effective implementation of principles/values such as sustainable usage of ecosystem services through better spatial planning.

The values regarding pristine natural areas, with a particular focus on the “African Wildlife Experience” in the Lowveld area, is currently a massive driver of tourism – the main primary economic sector in the Maruleng area (Van Jaarsveld, 2013: 28). This influences spatial planning and land use management to the extent that the largest part of Maruleng is still in its natural state in order to ensure a thriving wildlife tourism industry (Maruleng Municipality, 2014a: 28). This value held by the stereotypical ‘tourist’, drawn to the area by the wildlife and the natural state of large parts of the landscape, is a most positive value as it brings with it large-scale economic benefits. Whether these benefits are equally distributed amongst the people of Maruleng is, however, questionable, and possibly creates a distorted form of land use in the municipality, as is evident from the fact that some 88% of the population lives on about 25% of the land to the west whilst the rest is vast open, natural spaces (eastern side) utilised for tourism that target lucrative markets.

4.3 SOCIAL

The social data was captured using the VSTEOP public participation process, interviews conducted, StatsSA Census 2011 data, municipal documentation and academic literature. It provides an overview of the social conditions of people in the area. Understanding this fully anthropogenic scenario is important because when considering the socio-ecological system as suggested by complex and systems theory, it is inferred that the natural environment and social scenarios occurring within that same footprint cannot be detached (Reid, 2005: 6). It is one whole interconnected system in which one profusely influences the other. Therefore account has to be taken, and understanding created, of the social context of the area.

The social data is often very closely linked to economic data, although for the purpose of keeping to the VSTEOP process it will be lineated. To understand the current land use and development patterns better, one needs to be aware of the possible drivers which are behind them. Social information can often help unearth these development pattern drivers and help understand why the landscape came to be what it currently is.

4.3.1 Demographic information

Maruleng has a population of 94 857, and is by far the smallest of Mopani’s five Local Municipalities, contributing only 9% to its total population (Mopani District Municipality, 2012: 4). Within Maruleng there are 14 smaller political boundaries called wards. These wards are sub-divided to alleviate matters with regards to political representation. These were used as the smallest scale at which spatial

analysis of the Census 2011 (used in this study to create a quantitative overview and understanding of the municipality) could be done.

4.3.1.1 Population growth

Below is a table reflecting the population and household details for Maruleng during the 2001 and 2011 censuses. It is important because in terms of development trends it helps to indicate that the areas' population is not growing when placed on a temporal scale. This means that land use demand and the coinciding pressure on ES may not presently be increasing, which is important when wanting to plan for ecosystems-friendly land use pattern developments in the future.

Table 4.2: Population and Household Growth Pattern (*Statistics South Africa, 2012: 32*)

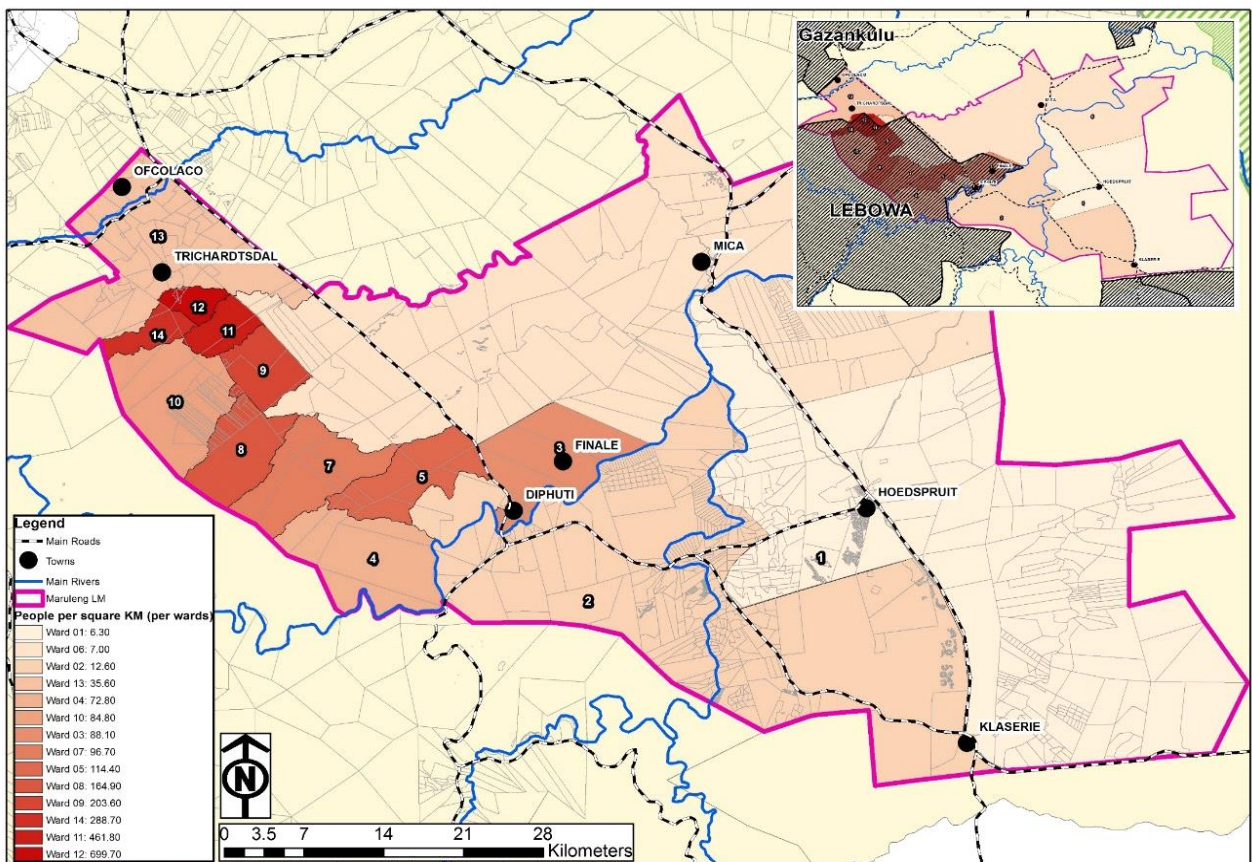
Population		Households	
Census 2001	Census 2011	Census 2001	Census 2011
94383	94857	19668	24470
% increased	0.49% (474 people)	% increased	24.40% (4802 households)

From the abovementioned table it is clear that Maruleng's population (from 2001 to 2011) appeared to be virtually stable, only marginally increasing by 474 people over a period of years). This broader scale focus at demand on land and ES related to population size, does not, however, reflect what happens on a finer scale. The municipality's main town of Hoedspruit is experiencing the opposite with exponential growth in the demand for land and ES in and around the town as its population steadily increases. Interviews with several people (Du Preez, 2014; Uys, 2014) of the local area concluded that when the municipality was established in 2000 as a category B local authority under the Municipal Systems Act (32 of 2000) (RSA, 2000; Maruleng Municipality, 2010: 8), Hoedspruit was not nearly as developed as it currently is. The town was demarcated as the administrative hub of Maruleng municipality, combined with the values placed around the "African Wildlife Experience" (as mentioned in the values section) and its associated influence on tourism, caused a massive demand for development space. The issue was, however, that the town was surrounded by private land from people unwilling to sell and soon the entire demarcated town-land was developed. The large demand for development could not be met by the exhausted supply of public land, hence greatly increasing the price of property in the area. The increase in the number of people in the town has also placed extra pressure on municipal drinking water delivery, meaning this basic ES is often not delivered to the residents of the town (AWARD, 2014b: 3; Du Preez, 2014; Malepe, 2014; Uys, 2014). This is a classic case where integrated land use planning – well informed by spatial planning – could have assisted in avoiding problems such as the one presented in the example.

4.3.1.2 Population density

Below is a population density map done for the municipality according to ward level from data collected from an online programme run by the Statistics South Africa website (StatsSA SuperWeb, 2014a). The ward population was divided by the area to calculate the number of people residing in the ward areas per Km².

As illustrated below some areas are extremely densely populated (i.e. ward 12 with a density of 700 people per square kilometre), especially in the wards just below the escarpment on the western side of the municipality, where there are many traditional villages. This is, as can be seen on the smaller thumbnail representation of Maruleng on Map 4.1, spatially strongly coinciding with where the former Apartheid homeland Lebowa lies, showing the strong influence Apartheid spatial planning still has to this day on the development trends in the municipality. These former homeland areas to the west offer few economic development opportunities and there are major infrastructure and service backlogs. These presently are rural densely populated residential areas – in fact, an estimated 88% of Maruleng’s population reside there. These densely populated areas are described as sprawling settlements still dependant on subsistence for survival (Diphororo Development and LEDET, 2013: 23).



Map 4.1: Population Density per Ward (Researcher, 2019)

4.3.1.3 Population distribution

The population distribution by age and gender is displayed in the pyramid below, giving us an insight into the make-up of the population and where vulnerabilities may lie (e.g. a very young population might mean more dependency on the economically active). The pyramid below has one very prominent feature – the fact that the vast majority of the population is 15 – 34 years old. This means that resilience to negative economic impacts should be higher than if it was a top or bottom-heavy pyramid because the majority of the people are of working age. This statement will, however, only be true if unemployment rates are not too high. More of this will be discussed later in the economic section.

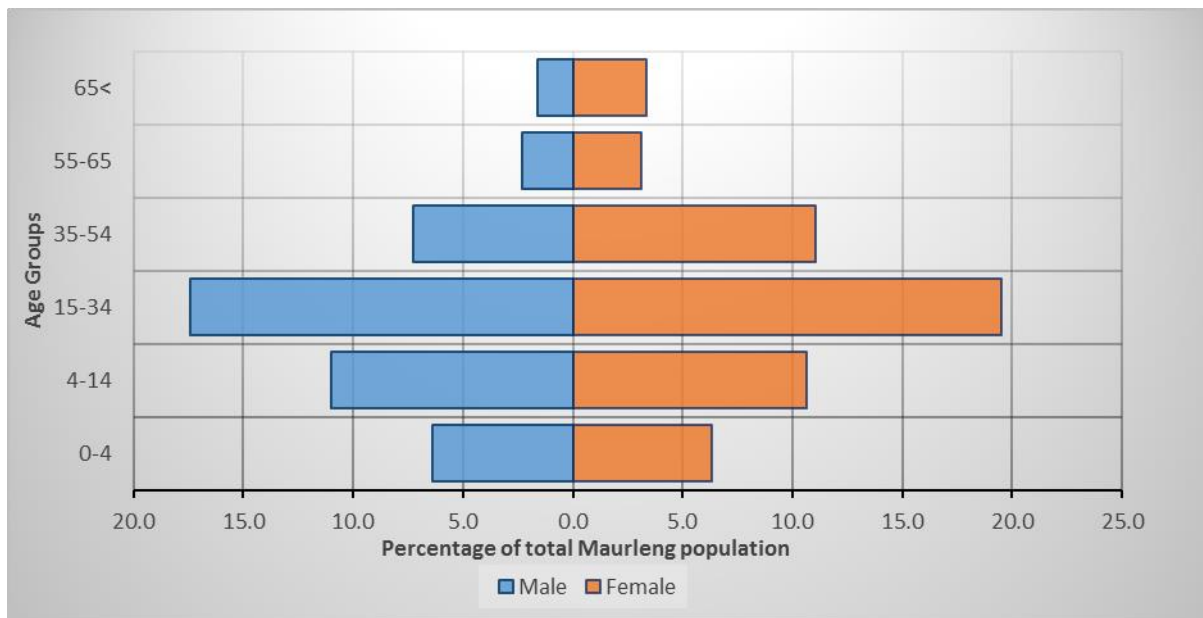


Figure 4.1: Population Distribution Pattern (StatsSA SuperWeb, 2014a)

4.3.2 Education

There are 38 primary schools, one combined school and 23 secondary schools with approximately 32,000 learners. The IDP (Maruleng Municipality, 2014a: 40) cites a serious shortage of schools and basic infrastructure (electricity, water, sanitation). The grade 12 pass rate of schools in the municipal area was 41.7% in the 2011 academic year. Maruleng also does not have a single institution of higher education – a possible cause of why only 2% of the Maruleng population is enrolled in, or has completed tertiary education.

To determine the education levels, StatsSA SuperWeb (2014b) data were utilised. The data was refined into six categories, from no schooling to tertiary education. The focus was placed on data of schooling

and thus a category in which 13 418 people were placed – data from the ‘not applicable’ category was removed from the analysis. It should also be noted that the statistics represent the entire population and not only people of an economically active age, as accessed from the Statistics Census 2011. For the purpose of this research these numbers were specifically viewed through the lens of vulnerability. Vulnerability in this instance, is defined as any form of education less than a Matric qualification, or Tertiary Education in this instance. This line has been chosen because having Matric or a tertiary education means that chances of being absorbed into the job market become higher, thus making an individual more resilient to negative drivers such as economic downturns, increasing mobility, employability and access to resources, as well as reducing reliance on direct natural resources/ES usage.

As can be seen in the graph below (all the categories shaded from red to yellow), the number of vulnerable people (parameter used: Not completing Matric or higher education), lies at 86% of the population of Maruleng to which the educational part of the Census 2011 questionnaire applied. This is startlingly high, and if aligned with rural livelihood typologies (Neves and Toit, 2013 95; Tittonell, 2012: 1), it brings the possibility of higher direct dependency on natural resources to the fore, – hence vulnerability to negative environmental drivers increases dramatically within a rural landscape.

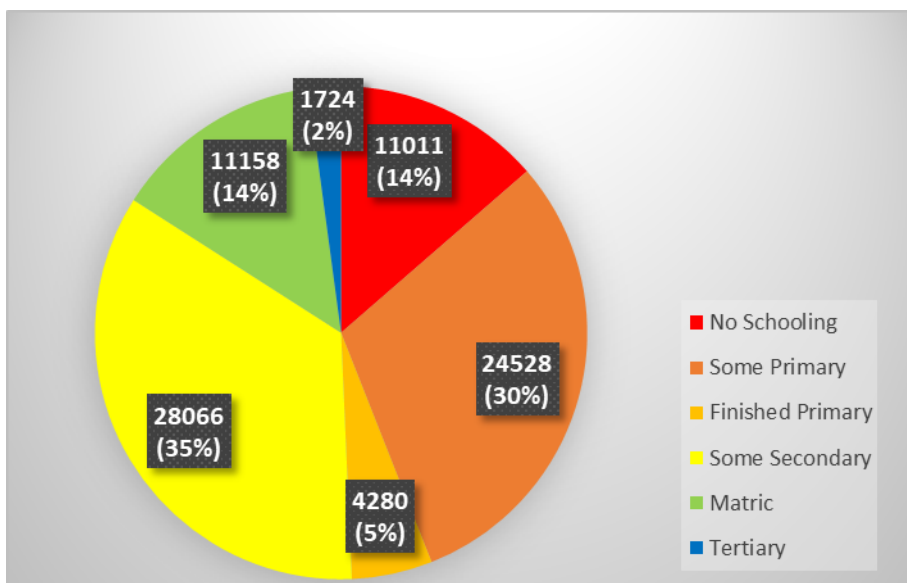
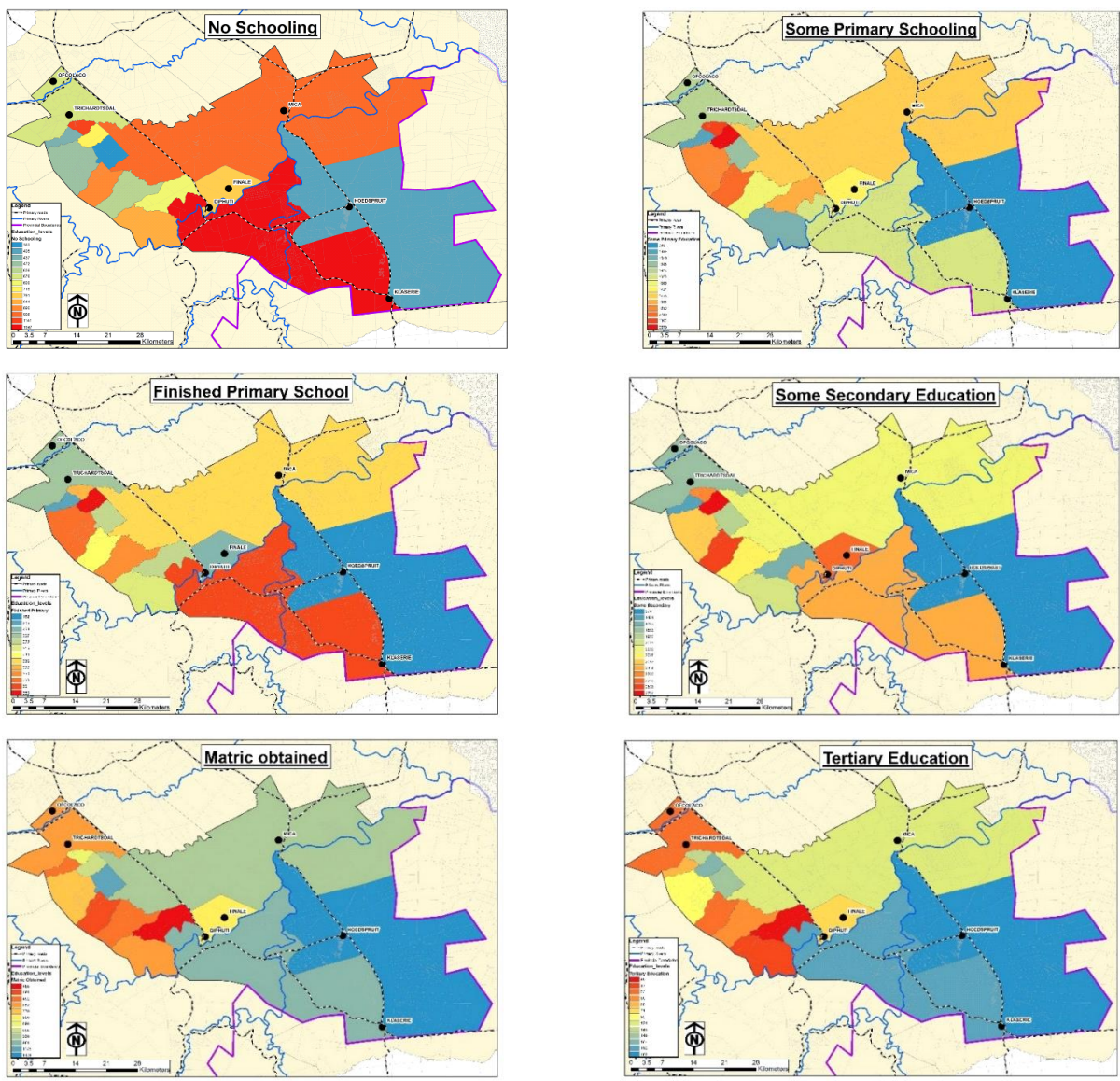


Figure 4.2: Education Levels (*StatsSA SuperWeb, 2014b*)

Below is a set of six heat maps dividing the categories of the abovementioned pie chart into six different maps to gain a more explicit spatial picture of where the largest vulnerable areas lie when using education as an indicator. Because the vulnerability line for education was drawn at anything below a Matric qualification the first four maps show the number of people per Ward, with the higher

the number, the warmer the colour, whilst the last two maps (showing people who have obtained Matric and tertiary education levels) do the opposite, with the higher a number the cooler the colour (as it is above the vulnerability line). Because of no access to spatial analyst on ArcGIS meant that a single interpolated map which combines the inputs from the six different maps – to create an overarching view of the education level per ward – could not be created. Analysing the maps below, it is clear that the eastern side of the municipality tends to have less vulnerability (cooler colours), whilst the south western area seems extremely vulnerable (warmer colours) when using the lens of education. In terms of resilience, as cited by Jenson and Fraser, (2011: 7), lack of education often coincides with a more direct dependency on the natural environment (Ecosystem services). This is most important for spatial planning and land use management purposes because it means that direct use of ES will, in the areas of high population, a lack of education and low employment numbers, have a tendency to be high.



Map 4.2: Education Levels (Researcher, 2019)

4.3.3 Health

In South Africa, viewed from a national level perspective, health care tends to be more problematic in and around rural areas compared to urban areas, and Maruleng is no exception. The municipality is served by one hospital in the north-west, in the Sekororo village, the most densely populated area in the municipality (Ward 12 on the population density map). Moreover, the Maruleng Municipality IDP (2014: 38) reports that ten other clinics exist throughout the municipality. This means there is one clinic for every 9 485.7 people.

One of the largest threats to improved health for the people of Maruleng is HIV/AIDS. It can be seen as a wicked problem when considering applying the systemic view, due to it entrenching itself in a SES and being reinforced by the results it brings to the fore. Some data in the Maruleng Municipality's IDP (2010: 45) suggest that around 2000 the prevalence in Maruleng was at around 27%. The StatsSA, Community Survey of 2007 indicated that during that 7 year period it decreased to about 26.8%. The percentage of HIV positive people were at that stage still higher than the average prevalence in Limpopo (22.1%), as stated by the National Department of Health (2012: 14). The issues caused by HIV/AIDS are endless, but the main concern for this study is the fact that it causes:

- A part of the population to become economically inactive (it hits the age groups of 2—49 the hardest, increasing economic dependency).
- An increase in child-headed households.
- The pressure it places on an already overburdened health system.
- Causing pollution through anti-retroviral medication.
- The fact that it puts pressure on plant and animal species because of higher demand for traditional medicine.
- Its nature of being a wicked problem causes the occurrence of other social and economic issues that often perpetuate its own existence.

(Diphororo Development and LEDET, 2013; Environmental Monitors, 2014; Limpopo Provincial Treasury, 2012; Malepe, 2014)

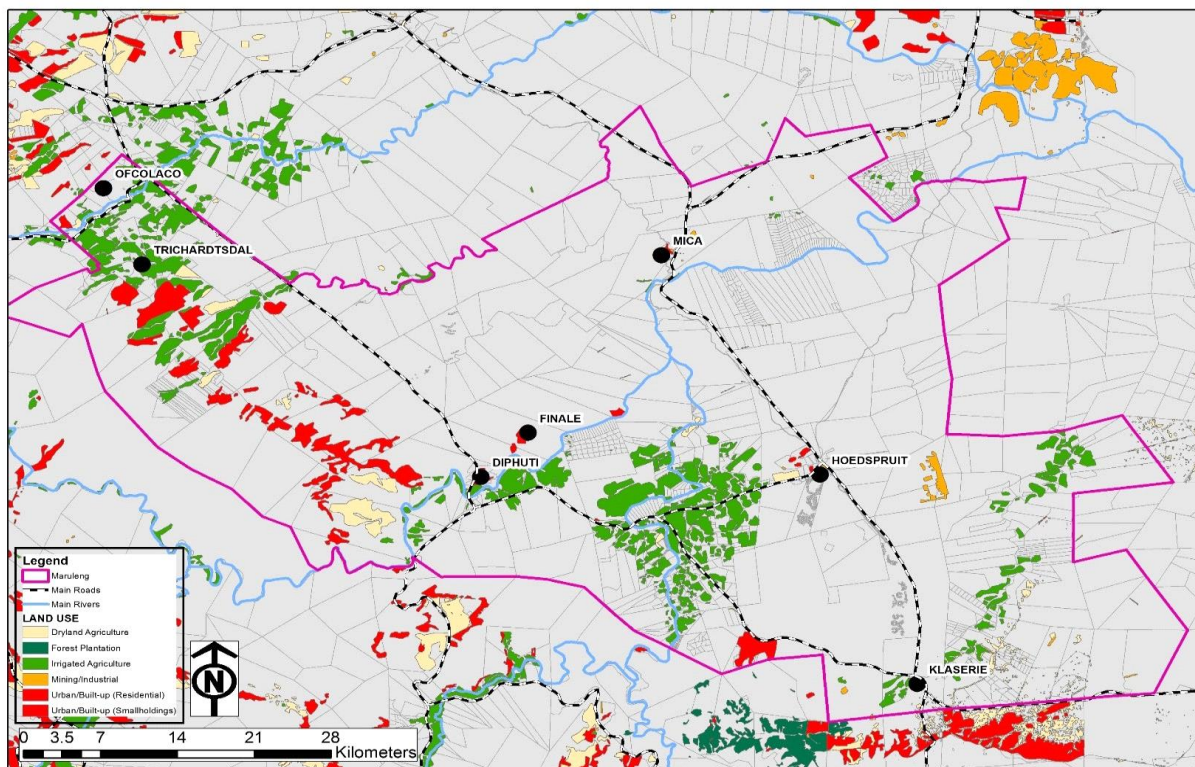
Maruleng is also affected by other diseases such as tuberculosis, cholera and malaria. Although information on them is scant, they are reportedly having less of an influence (AWARD, 2014b: 13; Business Trust, 2007: 28). The overburdened public health services in Maruleng are alleviated by some NGOs working on health in the area. An example is the Hlokomela Health Clinic run as an NGO looking

at healthcare for women (Du Preez, 2014) and assisting to reduce the vulnerability of people with regard to health related issues.

4.4 TECHNOLOGICAL

The technological contextualisation for the area was done through the VSTEEP public participation process, StatsSA Census 2011 data, interviews and municipal public participation meetings. It is mostly based on the status quo of development impediments and opportunities evident in the Maruleng municipal area.

4.4.1 Human settlement and development trends



Map 4.3: Maruleng and broader area land use (Researcher, 2019)

The spatial pattern of Maruleng is very much influenced by the legacy of apartheid, with the majority of its population concentrated in the rural areas in the western part of the municipality as is clear from the Land Use Map above. Hoedspruit Town is the main urban node in the study area, with Kampersrus (not on map) and Trichardsdal a second order urban node, according to the Maruleng SDF (Plan Associates, 2014: 33). There are no defined nodal points in the traditional village areas in the west below the escarpment area (indicated in red on the map above) where the majority – some 88% of

the population – reside. Interviews with the Environmental Monitors (2014) in the area paint a picture of almost non-existent service delivery in these areas. All eight of the Environmental Monitors recorded having been directly dependant on some or other form of ES, either water from wetlands or rivers, or firewood for cooking or lighting. This is discussed in more detail in the ecosystem services demand section under the environmental part of this VSTEOP overview. The development of the municipality is varied, with the eastern and northern (where there is also limited mining around Mica) areas mostly covered by private nature reserves focused on African wildlife tourism markets (for both international and South African upmarket tourists). The central eastern part is where Hoedspruit is situated and is thus the administrative and commercial centre of the region – there are also several game reserves. The southern quadrant boasts mainly tourism activities centred on the Blyde River Canyon, as well as vast areas of irrigated agriculture around the Blyde River as can be seen in green on the map above (Maruleng Municipality, 2014a: 28 and Plan Associates, 2014: 45).

4.4.2 Infrastructure

The SWOT analysis done for the Maruleng IDP (Maruleng Municipality, 2014b: 64) states that infrastructure upkeep is a major concern – this is enforced by constant raising of infrastructure issues at municipal meetings which include bridges, waste management, roads, streetlights and water supply (Du Preez, 2014; Maruleng Municipality, 2014d, 2014e). The greatest concern is, however, the backlog of basic infrastructure such as water, electricity and sanitation in and around the villages in the western part of the municipality. This is discussed more explicitly in the ecosystem services demand section. With regards to housing the Maruleng’s Local Economic Development (LED) Strategy (Van Jaarsveld, 2013: 47) states that a backlog of some 1,050 houses exists.

4.4.3 Transport

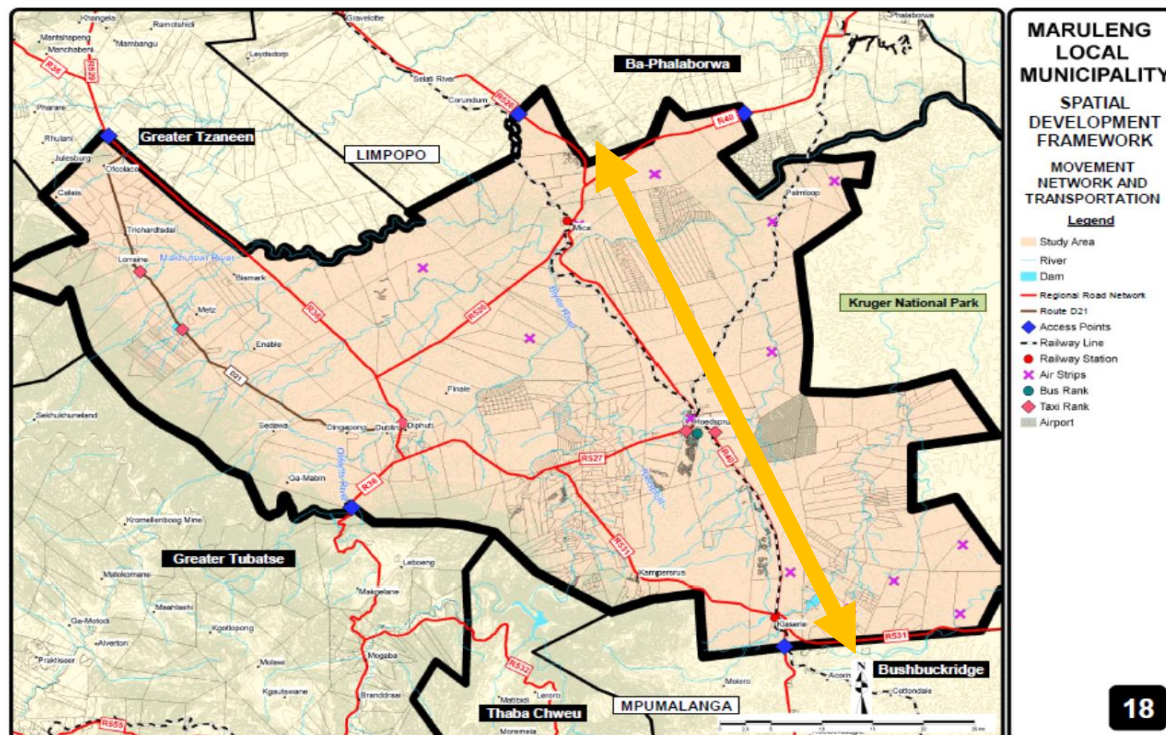
According to Maruleng’s LED Strategy (Van Jaarsveld, 2013: 48), the municipality has a total of 563.2km road network of which only 321.79km (51%) is tarred. The maintenance of roads remains a major challenge. Issues associated with the road network in Maruleng include the following:

- Local farmers regard the poor condition of roads as the key inhibitor to increased exports.
- The internal/local road network in the villages is in poor condition, and this negatively effects public transport to serve these areas.
- Lack of continued road network in the surrounding village areas.

(Maruleng Municipality, 2010: 66-67)

Maruleng has four main access points via road (the red roadlines in the map below). There is an entry point from the west which leads (R527) to Orgihstad, and upon entry descends the escarpment,

leading to Hoedspruit. It is of importance because it is the main access route to Hoedspruit from all the traditional areas in the west. It can be seen exiting into the Greater Tubatse municipality in the map below. The road (R36) north of it exiting into Greater Tzaneen municipality is also seen as important because it allows access to the rest of the municipal area for the densely populated Sekhororo villages in the north-west. The road corridor (indicated with the orange line on the map below) in the western part, running from Phalaborwa and Tzaneen in the north, through Hoedspruit and out through Bushbuckridge in the south, is of major significance to this study as it is seen as a national priority in the National Transport Masterplan 2005-2050 of the National Department of Transport (Parida, 2010: 6). It is thus likely to see future development. It is also a road corridor that is currently under extreme pressure according to several locals (AWARD, 2014b; Malepe, 2014; Maruleng Municipality, 2014b), from mining trucks driving from the Phalaborwa mining complex through to Maputo. The exact figure is unknown, but it is estimated the numbers of trucks using the R40 daily lies between 80 and 200 per day (AWARD, 2014b: 3 & Du Preez, 2014). Due to the nature of this thesis – in its attempt to be more systemic – the influence these trucks have on the level of ES demand in the form of game viewing, hunting and other tourism activities in nature reserves, needs to be monitored as it may have negative implications. An example in this respect could be tourists not wishing to have the unpleasant experience of being stuck behind trucks in traffic, or running a high accident risk on the roads due them being degraded by trucks – this is a social issue affecting all residents in the area. Although this research will not look at the trucking issue, it acknowledges that this is an unknown and potentially negative driver. The roads leading to the main town of Hoedspruit are also under pressure due to some 40 busses commuting to and from the town every day. These busses shuttle people who work in Hoedspruit from the local villages in the west, as well as people from Acornhoek, situated about 30km south, in the Bushbuckridge municipality (AWARD, 2014a; Maruleng Municipality, 2014e).



Map 4.4: Maruleng Infrastructure Set-up (*Plan Associates, 2014: 19*)

Other forms of transport here include a railway line passing from the north through to the south in the western part of the area, similar to the R40. Maruleng also has a second order airport (East Gate Airport) in the mid-eastern part that handles daily flights to and from OR Tambo International Airport in Johannesburg and Cape Town International Airport. Many of the private nature reserves also have private airstrips. These and the East Gate Airport mostly serve the tourism industry (nature reserves) in and a bit beyond Maruleng, with Phalaborwa and Nelspruit the closest other second order airports (Van Jaarsveld, 2013: 36).

Connectivity is an important principle of resilience (Simonsen *et al.*, 2014: 6). Good connectivity, for instance, makes it possible for people and animals to more effectively evacuate hazardous areas in disaster risk situations, and therefore it is important to help increase the resilience of local people who are vulnerable as it is. When wanting to promote integrated land use planning one has to take into perspective how well connected development is to other areas. The villages to the west of the municipality, where the large majority of people reside, are, for instance, quite vulnerable as there is only one major road serving the area (the R36). Spatial planning thus needs to take these types of scenarios into perspective when, for instance, considering further development and how to best integrate land use management and planning that promote optimal land use. It is, however, difficult as thinking systemically means one can not only consider economic incentives, or optimal land use,

but also have to take into perspective things such as social and environmental conditions of an area when making decisions regarding the spatiality of development.

Better connectivity is also a dual sided sword for the utilisation of ES, because as indicated earlier, bad transport networks hinder local farmers' ability to export produce, thus creating an issue of access to markets. Too much connectivity can also be detrimental because, as mentioned in (Walker & Salt, 2012: 69), road systems mean better access to ES and thus more usage, unfortunately often leading to exploitation.

4.4.4 External developments

Taking external developments into consideration is important for one to truly understand the way the Maruleng SES context is nested within a bigger system. Taking a broader view also helps one see external developments that may play a big role in defining how spatial land use planning is affected within a municipality's boundaries. An example in this regard is the fact that Tzaneen is about 30km north west of the edge of the municipality. Being a reasonably large town, together with its proximity to the rural settlements around the north western escarpment, means that most people in that area rather opt to do their shopping in Tzaneen, (AWARD, 2014a: 61; Environmental Monitors, 2014; Maruleng Municipality, 2014d: 44). Another example is the fact that to the south of Maruleng lies Acornhoek, which is part of the bigger Bushbuckridge area, covering some 10,250km², that had 541,248 people in 2011, mostly within densely populated traditional settlement set-ups (Bushbuckridge Local Municipality, 2012: 23). This influences Maruleng in several ways, including placing pressure on some of the natural resources found in the area (e.g. plants and animals used in traditional medicine) that are sourced from Maruleng to meet the large demands of Bushbuckridge. Another example (as can be seen on the land use map) is the large mining undertaking just north of the eastern side of Maruleng. This is the Phalaborwa Mining Complex, where sulphur, copper and other minerals are mined (Ba-Phalaborwa Local Municipality, 2013: 12). As mentioned earlier this results in a large number of trucks using the R40 and subsequently creating some social and environmental issues in the Maruleng area.

These few examples are simply aimed at painting a contextual background, and are by no means an exhaustive indication of all the external drivers – they're merely a few examples meant to make one realise that external drivers have tangible effects in an area and should be considered when looking at managing ecosystems and the ES they produce making better do of LM level spatial land use planning.

4.5 ECONOMIC

In this section some socio-economic data to help highlight key socio-economic scenarios, as well as the main sectors contributing to Gross Domestic Product, will be briefly discussed. The primary economic sectors can undoubtedly be viewed as most reliant on the environment (natural and changed) and this is one of the main reasons an ecosystem services approach was taken. Referring to the ecosystem services demand section (Section 4.6.2), it is also clear just how many people are directly dependent on ecosystems for basic services such as drinking water and fuel wood as part of fulfilling their basic needs because of not being afforded the economic opportunities to do so.

4.5.1 Socio-Economic Overview

4.5.1.1 Employment and Dependency

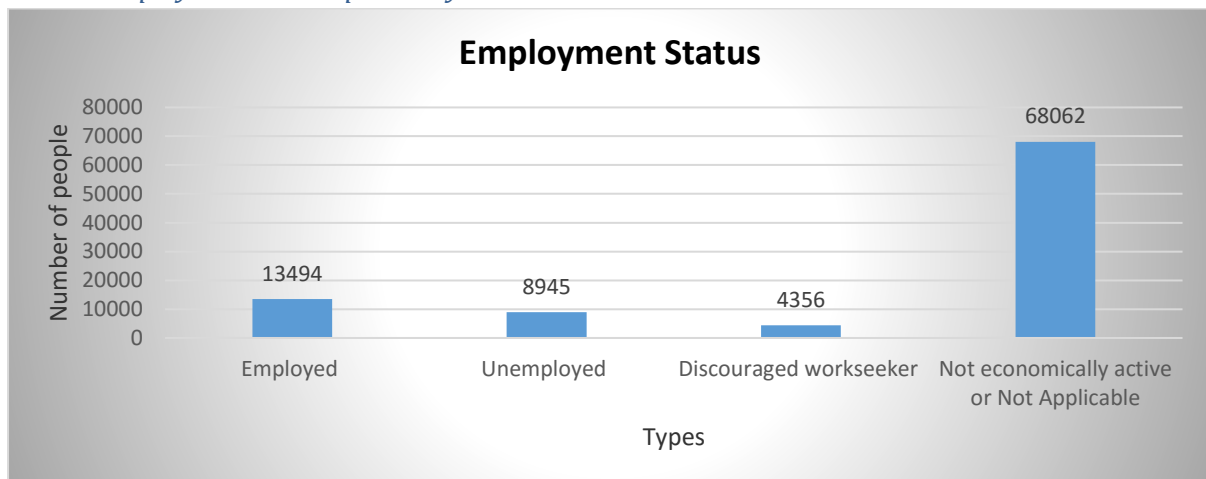


Figure 4.3: Employment Status (*StatsSA SuperWeb, 2014c*)

Only a small portion of Maruleng Municipality's population is formally employed as can be seen in the figure above. The 13 494 people formally employed are only about 14.23% of the entire Maruleng population creating a large dependency ratio for the area where 86% of the population is dependant (not economically active; not applicable; unemployed or a discouraged work seeker) on the 14% of the population that is economically active. This brings on vulnerability for communities and often increases the direct dependency of people on natural resources such as fuel wood and game meat for subsistence (See figure 4.3).

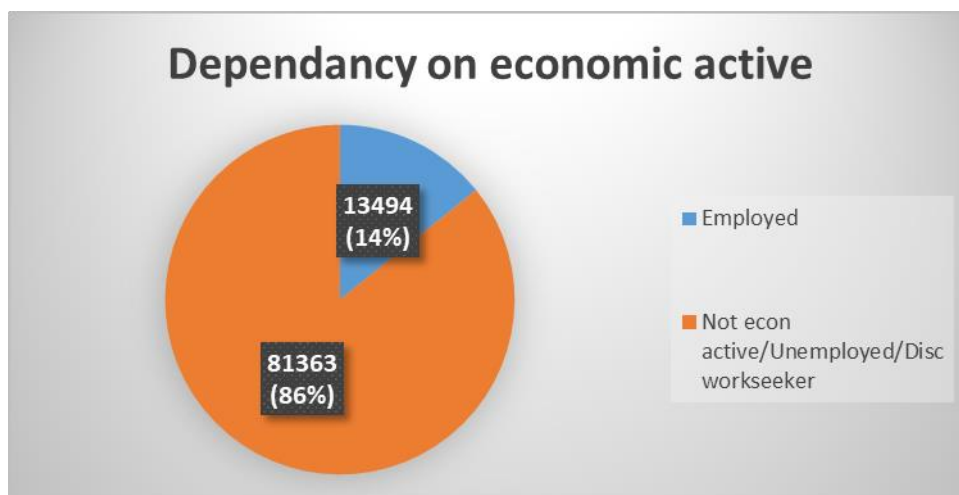


Figure 4.4: Economic Dependency (*StatsSA SuperWeb, 2014c*)

When one considers the employment figures adding the unemployed and discouraged work seekers and employed then dividing the unemployed and discouraged work seekers $[(8945 + 4356) / (13\ 494 + 8945 + 4356 = 26\ 795)]$ the broader unemployment (with discouraged work seekers included) adds up to 49.64%. This leads one to hypothesise that the dependency levels increase the direct demand on ecosystem services in all its forms. It also suggests that some of these communities with the high dependency levels are not very resilient at all due to their inability to diversify income (Neves and Toit, 2013: 108), often creating a scenario where economic dependence on one breadwinner for a large number of people develops – an element closely linked to uniformity which is a known resilience reduction factor (See figure 4.4).

4.5.1.2 Household income

The household income profile serves as an important indicator of the socio-economic well-being of the research area, and is therefore explored in detail. Figure 4.5 below indicates household incomes per category as a percentage out of 100 for the specific area (i.e. in Maruleng 15.6% of the population receives no formal form of household income). On average Maruleng is relatively similar to Mopani and Limpopo, but with the lower income ranges there are some differences with Maruleng's (no Income to R38 400 per annum categories) being a bit higher than the Mopani and Limpopo averages (Van Jaarsveld, 2013: 24), indicating that Maruleng is a less well-off municipality. This places most households in the marginally lower income level categories. In 2001 88% of the population lived below the annual Household Subsistence Level (R19 200 or less per household per annum, at the time) – using an inflation calculator, it is estimated that in 2011 83% of people lived below the HSL level (R38 400 or less per household per annum).

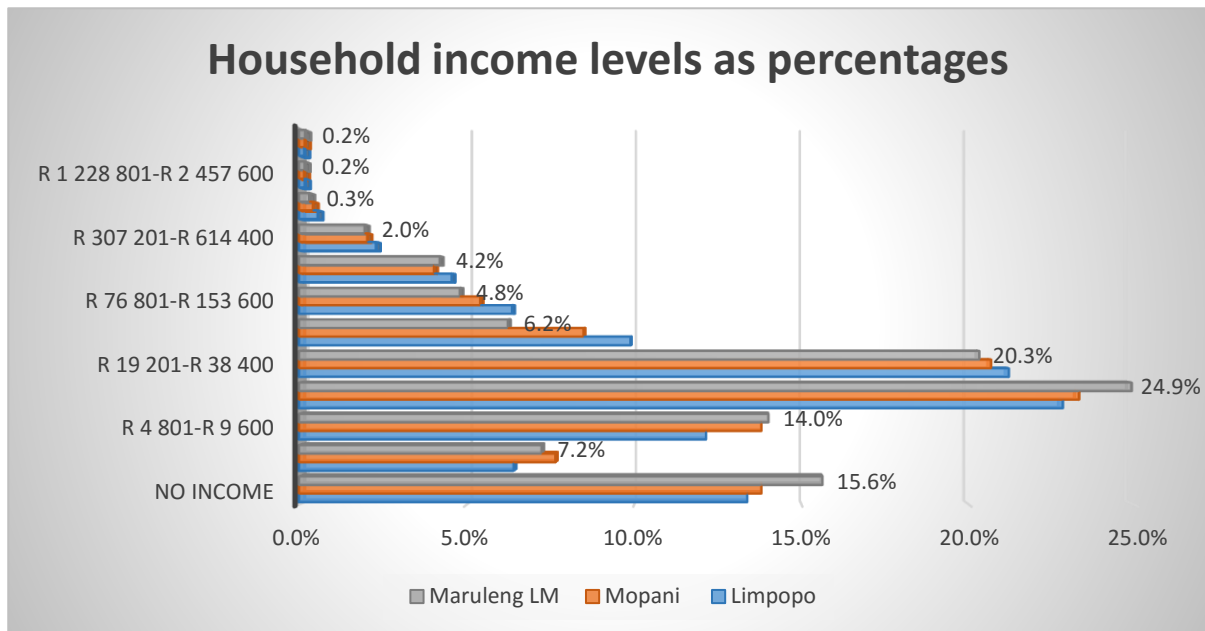


Figure 4.5: Household Income for Maruleng, Mopani and Limpopo (Van Jaarsveld, 2013: 24)

In figure 4.6 below is a graph further delineating income per ward. The data is displayed as Income Category per ward with regards to the total amount for Maruleng. From the graph below it is clear that ward 1, on the eastern side, in which Hoedspruit lies, is by far the most prosperous, with 46% of the households in Maruleng earning R307 601 and higher per annum and 37% of the households earning R153 800 – R307 601. The rest of the wards share a fairly equal income spread.

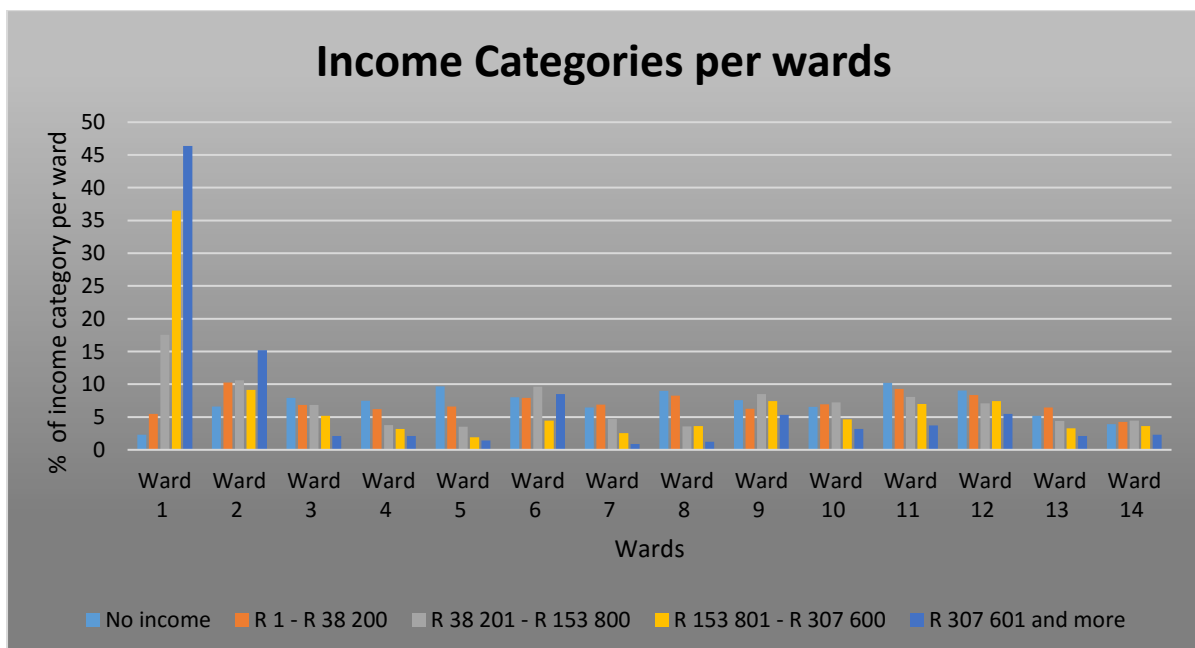


Figure 4.6: Household Income Levels per ward (StatsSA SuperWeb, 2014c)

4.5.2 Economic sectors

The salient features of the economic conditions in the various local areas are discussed in this section. In order to facilitate a situation whereby the individual economic activities throughout the district can be measured, a standardised classification is utilised. The following sub-section (see figure 4.7) offers a delineation of the various economic sectors as per the Standard Industrial Classification, used internationally.

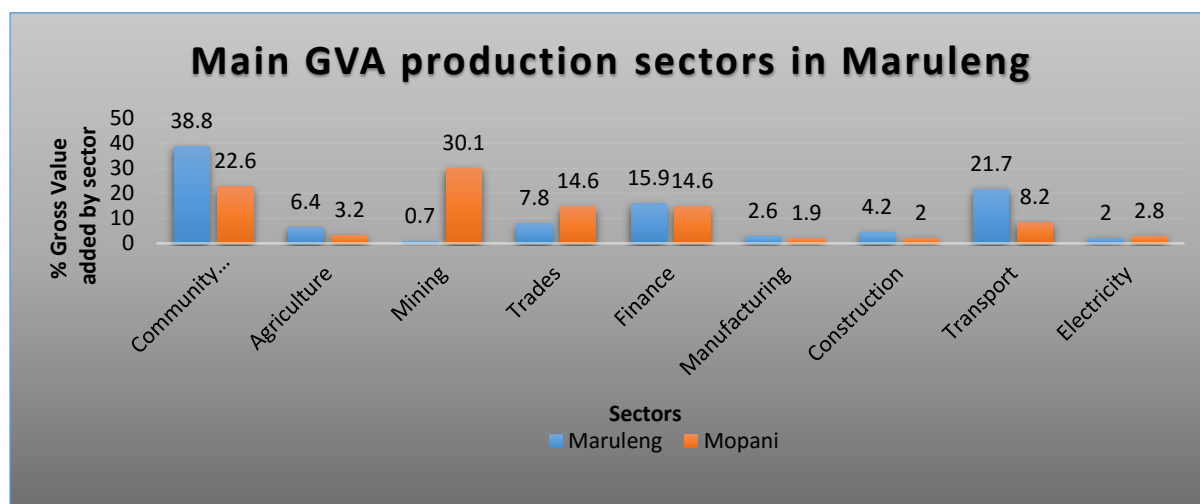


Figure 4.7: Main GVA Sectors in Maruleng (Wilson, 2012)

The main categories as set out in the South African Standard Classification of all Economic Activities (1993) are utilised for the purpose of analysing the main economic sectors, as can be seen in the above graph. A total of nine sectors are distinguished. As can be seen the most prominent contributor to Gross Value Added (GVA) in Maruleng is Community Services, standing at 38.8% of the total GVA for the area. This is the case because of the large development and social upliftment investments occurring in Maruleng from provincial and national departments. The transport sector also makes a sizeable contribution to GVA (21.7%) due to massive demand for transport from the villages (western side) to Hoedspruit (the economic hub of Maruleng) and other areas, due to the purchasing power of those areas not being met with a large enough local supply in the rural areas (Uys, 2014). Another prominent feature is the incredibly small contribution mining makes to GVA in Maruleng, especially when compared to the district municipality, Mopani, in which it is situated.

A frequently asked question about the above standard 9 categories is “into which sector tourism falls”. This is a question of particular relevance since the perceived idea is that tourism is Maruleng’s main economic driver, as by example of Maruleng Municipality having the slogan “Wildlife Haven” (Fhatanani Management Services, 2013: 55). The tourism sector, however, generally is delineated into other economic sectors, with for example the high GVA for transport being a clear link to tourism

through the several travelling agencies and transport nodes (like for instance the Eastgate Airport) present in this area. Tourism as primary sector from which many other secondary and tertiary economic activities flow is thus uncalculated for in Maruleng’s latest IDP, which is an area of concern because spatial planning that takes a systemic approach to understanding the area cannot be created if one of the main drivers is not understood.

Even though Statistics South Africa does not have readily available data on the Gross Value Added per sector with regards to tourism in Maruleng, or the employment by sector, there is an online programme accessible through Quantec (2015), a statistical and Econometrics Company, which provides contractors that develop documents such as IDPs and LEDs with economic statistic information. Their data were used to attain the GVA and Formal Employment information below.

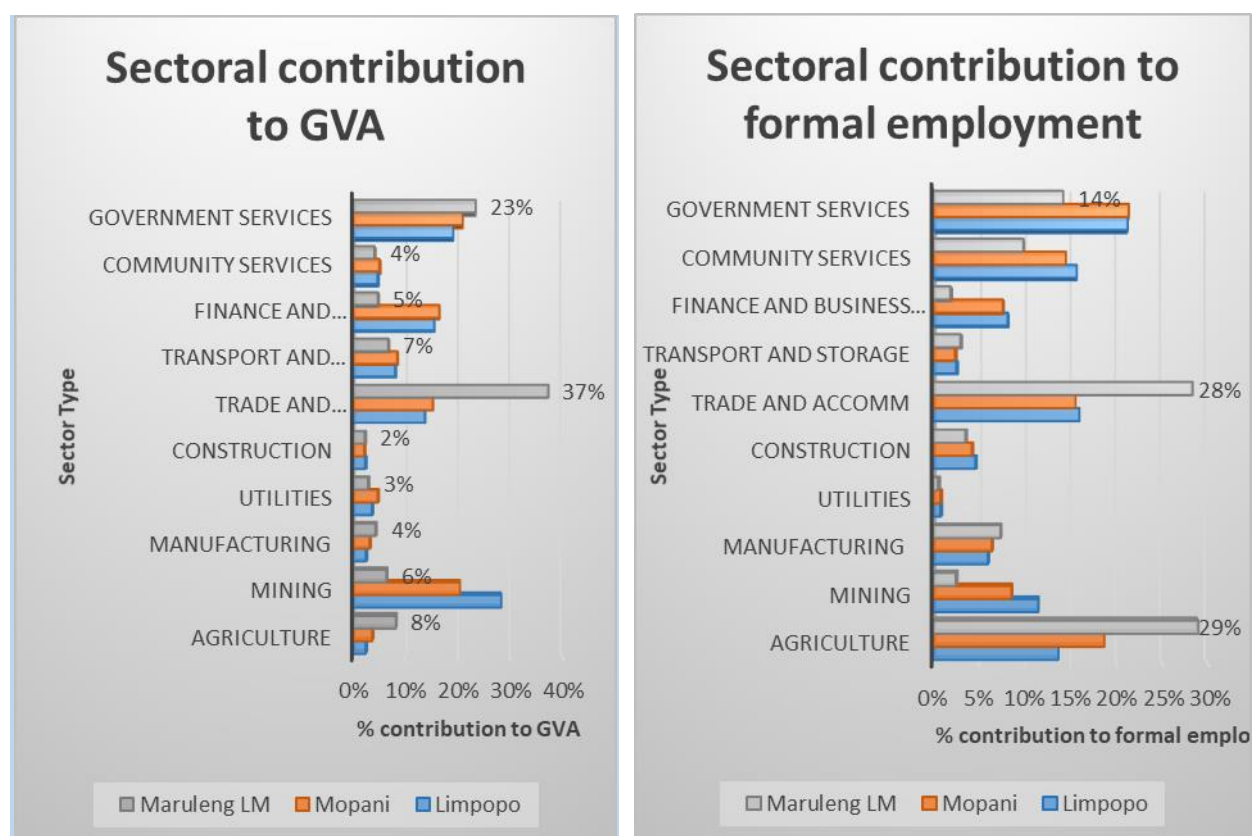


Figure 4.8: Maruleng’s Main GVA Producing Sectors and their contribution to Formal Employment (Wilson, 2012)

The GVA contribution graph above clearly indicates some prominent differences to the one done by Wilson (2012) – the most important one though is the fact that the Trade and Accommodation category represents tourism more directly, making more explicit the economic benefits brought forward by tourism in its contribution to GVA and employment.

Below the main GVA and employment sectors will be discussed briefly to help create a contextual understanding of how they became prominent.

4.5.2.1 *Community services*

When looking at the high GVA for Community Services, this is likely because Maruleng has been identified as a Presidential Poverty Node Priority, with several government funded projects such as the Comprehensive Rural Development Programme from the Department of Rural Development and Land Reform, Biosocial Projects, the Working for Water/Wetlands/Fire from the Department of Environmental Affairs and the Expanded Public Works run by the Department of Public Works, being prominent in the Maruleng area, particularly the western side where all the traditional areas are (Diphororo Development and LEDET, 2013: 57; Uys, 2014). These projects have various focuses, with especially the environmental projects being of high interest for this study, as their spatial footprints and purposes could help realise how to better promote truly integrated local municipal level spatial planning that acts as an informative tool for not only the municipality, but also for other institutions working in the area.

4.5.2.2 *Agriculture*

The agricultural sector of Maruleng is quite varied, combining different market opportunities with the available ES and the means to exploit that. Below is a brief summary of the main types of agriculture and their spatiality:

- Commercial mango; citrus and avocado are farms spatially focused along the Blyde River and citrus near the northern western area of Trichardsdal (as can be seen on the Land Use Map 4.3).
- Some commercial game farms (breeding with the likes of buffalo and sable) also occur throughout the area, including the south western part of the escarpment and the north western part of the municipality on the eastern side of the R36.
- Subsistence farming occurs all around the western part of the municipality encircling the rural settlement.

(Business Trust, 2007: 65; Fhatanani Management Services, 2013: 43 - 44)

Agriculture in all its various forms is one of the most prominent sectors with regards to employment as can be seen in Figure 4.8 above. When looking at GVA it is a lot less prominent though. This is a well-recognised trend, with agriculture being a good wealth spreading mechanism through informal agriculture (Duraiappah *et al.*, 2011: 516). Formal labour intensive agriculture also exists in Maruleng with citrus and mango creating a large number of jobs that are reflected in the employment per sector

category. According to Statistics South Africa data for the 2001 Census (Statistics South Africa, 2012: 51) some 41% of employees worked in the agricultural industry whilst the data from Wilson (2012) on Maruleng indicated that about 29% of people are employed in this sector. A speculative guess is that this decrease is occurring due to mechanisation and a shift from agriculture to more tourism orientated activities.

4.5.2.3 Mining

Whilst mining is a priority sector for Limpopo and the general upper Olifants catchment area there is no prominent mining in Maruleng. The town called Mica has some limited mining activity although none of Maruleng's IDPs (2007; 2011, 2014 and 2019) indicate the relevance of it – just simply mentioning it. Statistics South Africa Census data for 2001 (Statistics South Africa, 2012: 34) indicated that mining in Maruleng made up 0.9% of the total employees, whilst from the Maruleng IDP (Maruleng Municipality, 2014: 49) data it seemed to have gone down to 0.7% by 2012, thus making it an insignificant driver in the Maruleng area, although there is large scale mining very close to Maruleng with the large Phalaborwa Mining Complex just north of the boundary (indicated in orange on the Map 4.3: Maruleng and broader area land use, page 82).

The amount of development through various government programmes, as mentioned under Community Services, has led to a new type of ecosystem service utilisation and exploitation emerging in the form of sand mining for construction purposes. According to an interview done with Environmental Monitors (2014) in the Oaks area, several non-perennial rivers are being mined intensely for building sand. This informal and direct usage of ecosystem services causing degradation to the natural environment, could possibly have negative future effects and therefore is an issue that needs to be tracked.

4.5.2.4 Tourism

Maruleng Municipality is wedged between some of Limpopo's prime tourist attractions, including the Kruger National Park, Timbavati Private Reserve and Blyde River Canyon. Significant tourism-related activities exist as the main economic contributor in Maruleng (Plan Associates, 2014: 37). According to Van Jaarsveld (2013: 36) the existing airport plays a significant role in increasing tourist traffic and establishes the Maruleng Municipality as a gateway to the Kruger National Park and surrounding areas.

The vision of the Maruleng IDP (Maruleng Municipality, 2014: 7) is for the many cultural opportunities within the municipal area to be developed into tourist attractions, as well as the growth and development of the agricultural sector. The IDP (Maruleng Municipality, 2014: 13) states that tourism

related economic activities should be promoted and facilitated by accommodating private sector investment in the development of game reserves, game lodges, tourism related manufacturing and trade and hospitality developments. From a spatial land use planning perspective that wishes to promote improved ecosystems management, the type of tourism taking place in Maruleng is very positive. It is a non-consumptive use of ES that promotes keeping the environment in pristine condition, whilst also promoting socio-economic upliftment through the jobs it creates and its strong impact on the GVA. It thus promotes improved social, environmental, spiritual and economic conditions in the municipality, helping maintain an integrated land use pattern that actively creates healthier natural ecosystems.

4.6 ENVIRONMENTAL

Because this study is focused mostly on improved incorporation of ecosystems into spatial land use planning at local municipality scale, the largest focus will be placed on this environmental section. The ecosystem service angle taken means that the environmental sector is divided between ecosystem service supply and demand.

4.6.1 Ecosystem Service Supplies and their state

Ecosystem services supply is what the environment provides to the people of an area (Corvalán *et al.*, 2005: 2). Supply of this kind is hard to bound, with the complex system of biodiversity factors all coming together in different configurations that bring different bundles of benefits (Reid, 2005: 6). The consumption patterns (speed of consumption, type of consumption, utilisation methods) of these bundles also determine the ability of the ecosystems to deliver services sustainably. The following overview of the ES supplies in the area is focused on creating an informative understanding of what currently exists. It is, however, only expanded upon as singular units, with limited discussion on their interaction as a SES system and what that entails for ES supply due to the complex nature thereof – and it being outside the scope of this research.

4.6.1.1 Biophysical overview

The biophysical overview is a very brief summary of the area with regards to soil and vegetation. It is key to understand these underlying features that often play a prominent role in determining many factors with regards to the ability to produce ES, which this study insists should then inform spatial planning land use management in order to ensure optimal and sustainable use (i.e. determining the ability to provide groundwater, agricultural potential and the possibility of resource extraction via mining).

The biophysical elements are briefly summarised below:

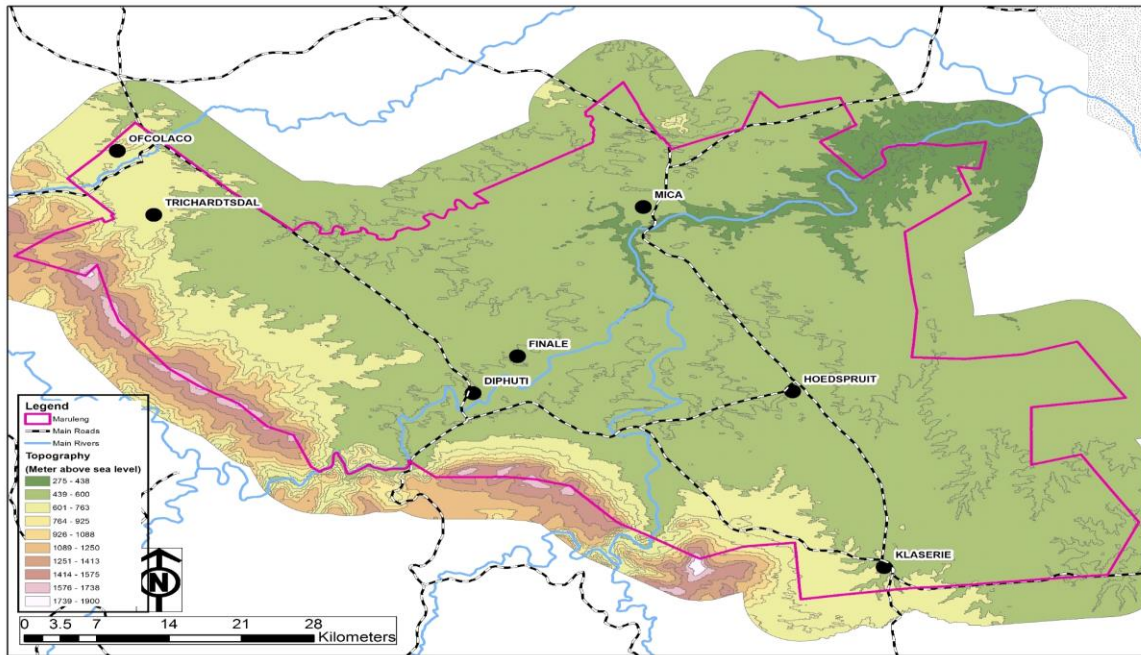
- **Geological systems:** Transvaal sequence (sedimentary and metamorphosed rocks) and Archean granite and Gneiss Basalt complex (sedimentary rocks with intruding lava).
- **Lithology:** Undifferentiated rocks and various mixed lithologies; predominantly carbonate rocks (limestone and dolomite); predominantly meta-arenaceous rocks (quartzite, gneiss and migmatite); alluvium (clay, sand, gravel and boulders) and basic/intermediate/mafic extrusive rocks (basalt and andesitic lava).
- **Soils:** Glenrosa and/or Mispah forms; Miscellaneous land classes- rocky areas with miscellaneous soils; Red-yellow apedal- freely drained soils- red- high base status- < 300 mm deep; Red-yellow apedal- freely drained soils; red and yellow- dystrophic and/or mesotrophic.
- **Bioregions:** Lowveld, Mesic Highveld Grassland and Zonal and intrazonal Forest Bioregions (Environomics and MetroGIS, 2009:3 & SANBI, 2018)

The climatic conditions of Maruleng places it in the warm semi-arid zone category, with low annual rainfall patterns ranging from 401 – 600mm per annum. The western side, near the escarpment, experiences higher rainfall patterns ranging from 600 – 1000 mm per annum (Plan Associates, 2014: 37).

4.6.1.2 Topography

Below is a map of Maruleng's topography. As indicated the left (western side) boundary runs along the Drakensberg escarpment from north to south. This escarpment reaches heights of up to 1900 meters above sea level. The escarpment gives way to the Lowveld towards the east, consisting of areas ranging from 763 meters above sea level close to the escarpment, to a general height of 600-439 meters above sea level throughout the rest of the municipality – with a general decline from west to east.

According to Holness *et al*, (2014: 17) topography is an important contributing factor with regards to the ability of an area to deliver ES, but another important factor is its ability to promote the general resilience of a landscape to certain negative drivers (Driver *et al*, 2012: 13). The topography of Maruleng, combined with other socio-political drivers, such as the Apartheid formation of homelands for instance, meant that people settled in the areas close to the escarpment where, amongst other factors, their demand for direct ES could be provided for by the environment. An example of this is the area's ability to provide water – further details in the ES Demand section.



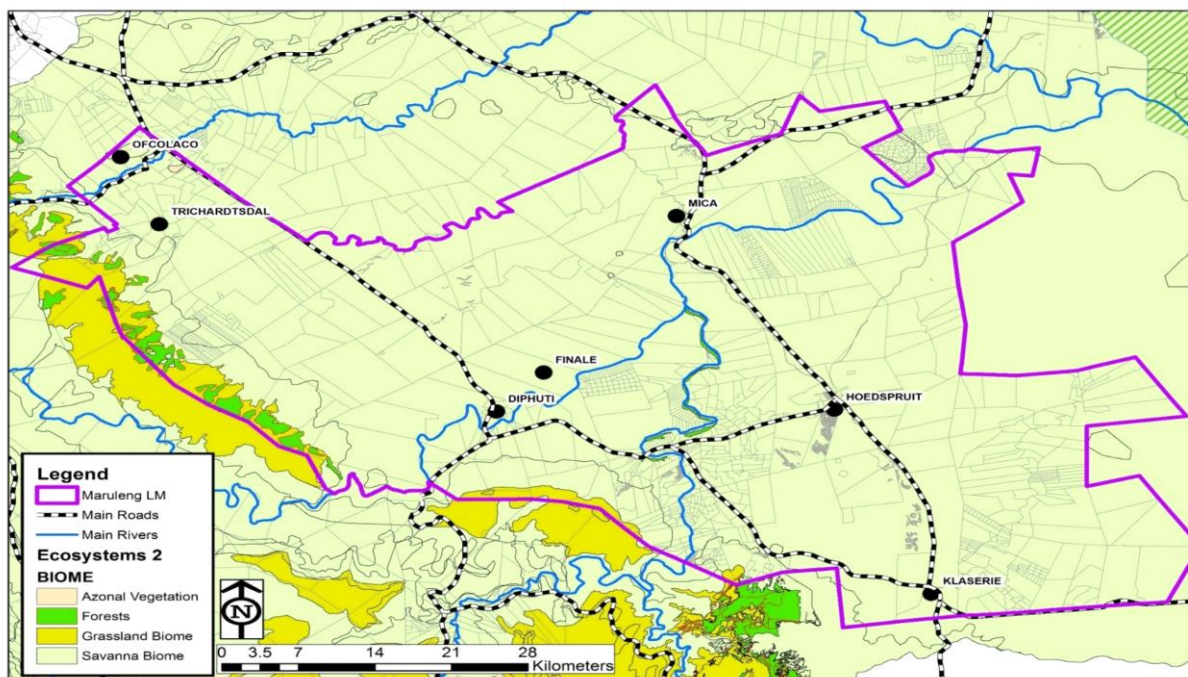
Map 4.5: Topography (Researcher, 2019)

4.6.1.3 Biomes

Maruleng contains three different biomes, predominantly consisting of savannah in the foothills and Lowveld area over undulating plains and extremely irregular undulating plains (Evironomics and MetroGIS, 2009: 5), as can be seen in the map showing where these biomes occur below. The Forest areas mostly occur in the east facing mountain slopes of the western escarpment and some natural forest patches remain along the Blyde River before it enters the Olifants. This is recognised as a vulnerable ecosystem by SANBI's B-GIS (2018) site. The vast majority of Maruleng, however, consists of Savannah (as can be seen on the map below (light green)), as well as in the Biomes table below, with the map also indicating some grasslands occurring in the area, mostly at higher altitudes. Different biomes contribute to different ecosystem services (Biggs *et al.*, 2015: 146), in combination with different situations (environmentally and anthropogenically), but unfortunately this research does not go into detail about these due to limited information. It would, however, be of future interest to identify the possible bundles of ecosystem services biomes produces under certain circumstances.

Table 4.3: Biomes (SANBI, 2018)

Biomes	
Name	Size
Forests	21.7ha (0.01% of municipality)
Grassland	10 013.9ha (3.09% of municipality)
Savannah	314 394.6ha (96.91% of municipality)



Map 4.6: Biomes (Researcher, 2019)

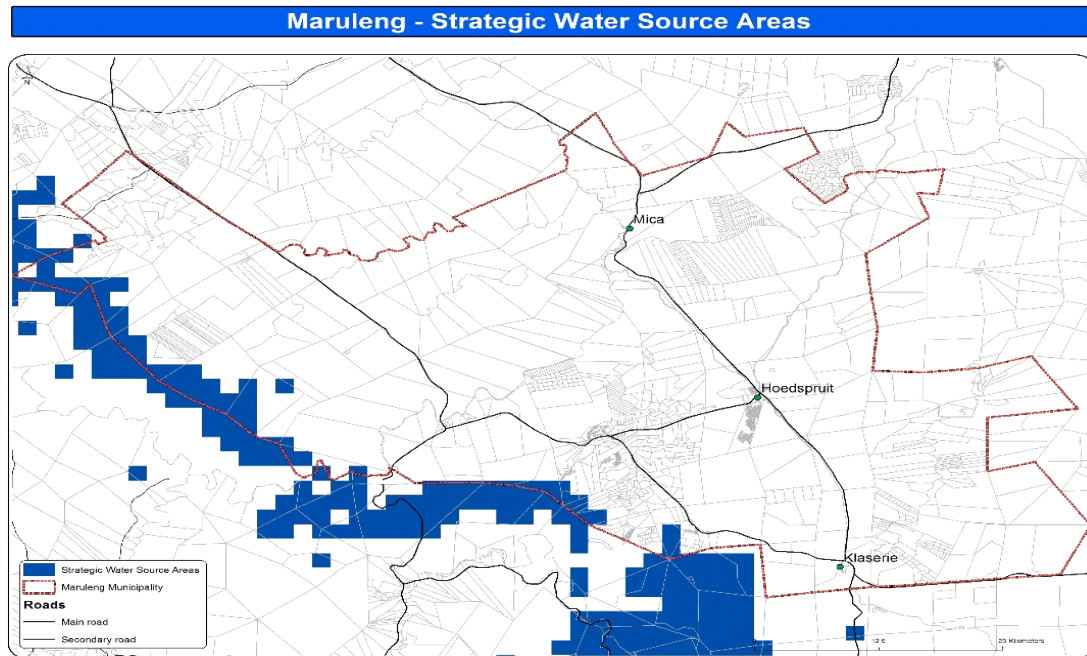
4.6.1.4 Threatened ecosystems and key ecosystem production areas

Table 4.4: Threatened Ecosystems (Source: SANBI, 2018)

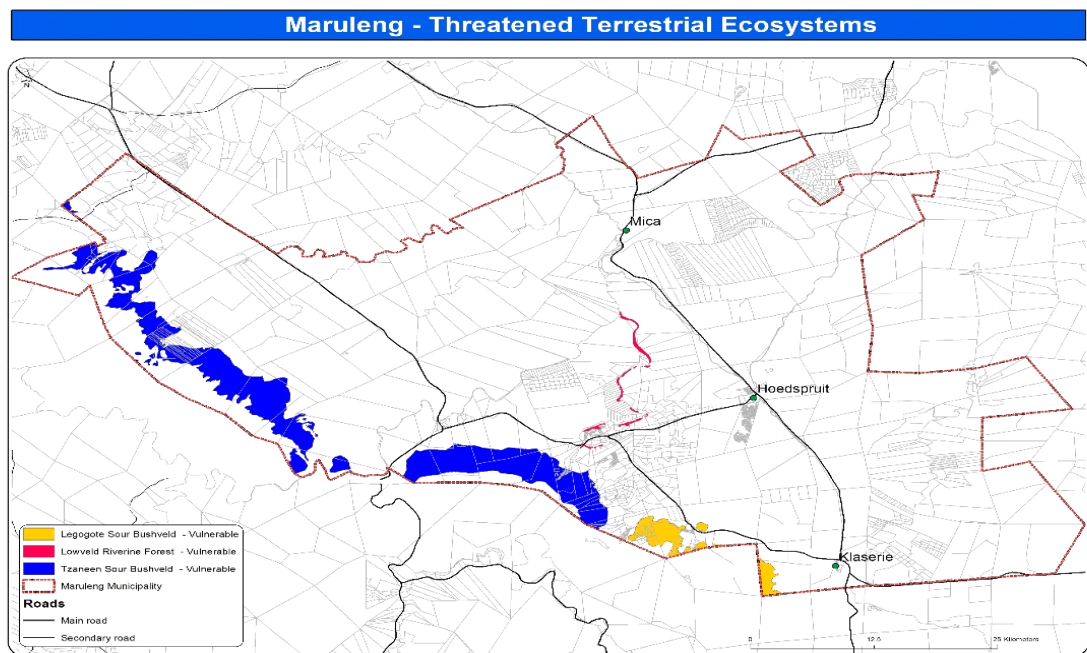
Critically Endangered (CR)	
There are no critically endangered ecosystems in Maruleng Municipality	
Endangered (EN)	
There are no endangered ecosystems in Maruleng Municipality	
Vulnerable (VU)	
Name	Size
Legogote Sour Bushveld	2177.8ha (0.67% of municipality)
Lowveld Riverine Forest	403.5ha (0.12% of municipality)
Tzaneen Sour Bushveld	17 223.8ha (5.31% of municipality)

In total there are three vulnerable/threatened ecosystems in Maruleng covering 19 805 hectares (6.1% of the total municipal area) as can be seen in the table above (SANBI, 2018). Below is a map of the threatened ecosystems, as well as one indicating the key Strategic Water Resource Areas. These two maps are put side by side to show the clear overlap between them. This correlation is a clear indication that the escarpment area is key to keep in a natural state through labelling it a Critical

Biodiversity Area (as done by the Limpopo Conservation Plan V2 (2013)). For spatial planning these areas are thus key to recognise and the utmost should be done to protect them from development, as they are not only key areas for the abovementioned reasons, but also most important in terms of ES delivery to the villages situated just below this escarpment area.



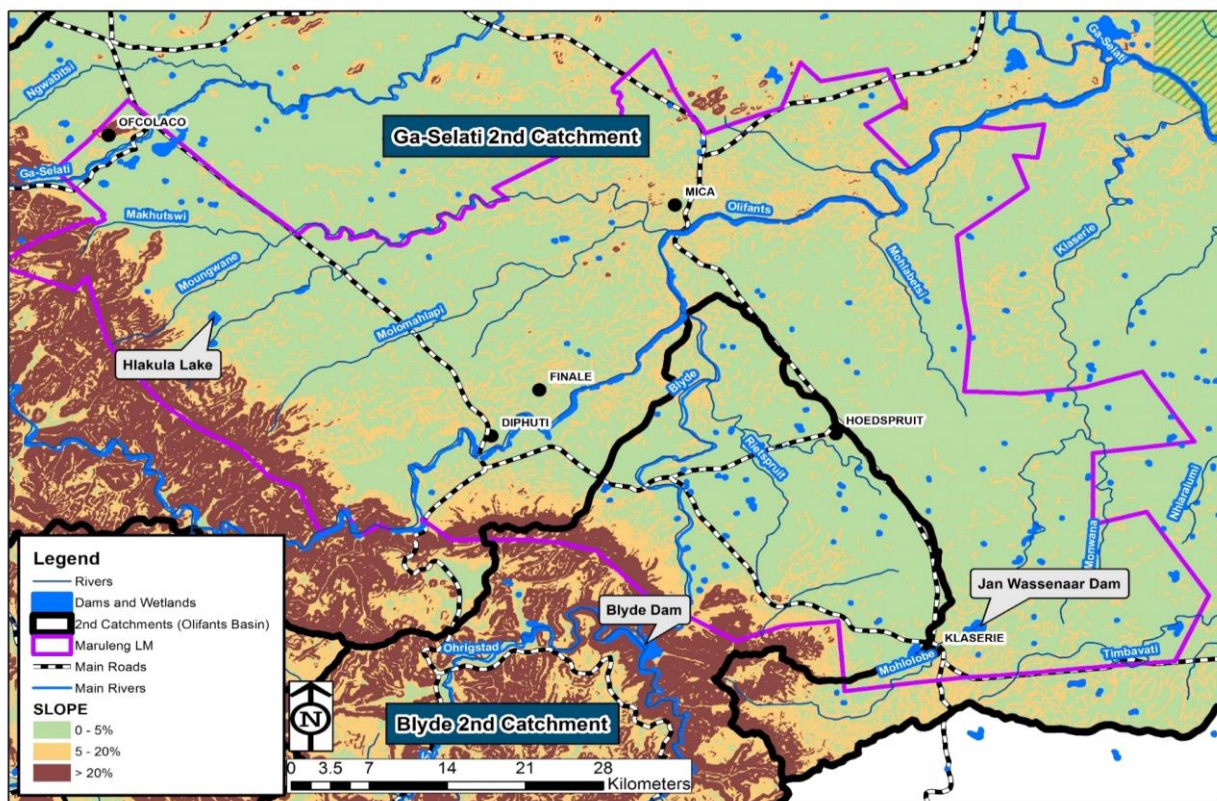
Map 4.7: Strategic Water Resource Areas (Holness et al., 2014: 16)



Map 4.8: Threatened Ecosystems (Holness et al., 2014: 14)

When considering development planning these areas are pristine due to them being unreachable, but from interviews (Malepe, 2014; Uys, 2014) it has emerged that the competition for land and feed due to the high density and rural livelihoods below the escarpment, has created a scenario where cattle have started grazing higher and higher up the mountains. Even though limited land development is occurring around some of these threatened terrestrial ecosystems and strategic water source areas along the escarpment, other land use activities may impede the ability of these key areas to produce ES for the communities below the escarpment and people further down in the Maruleng municipal area.

4.6.1.5 Water related ecosystem service provision



Map 4.9: Water Related Ecosystem Service Features (Researcher, 2019)

Rivers

Rivers play a key role in the landscape, acting as life arteries flowing through terrestrial ecosystems. They ensure that high biodiversity persists, promote general ecosystem resilience through promoting diversity, and also provide key services to the people (Butler *et al.*, 2003: 77). Water related ecosystems are highly diverse and extremely important for human development. Hence some information on the rivers, as main source of water related ecosystem services, will be provided.

Maruleng lies completely in the Olifants River Catchment and according to the SANBI B-GIS website (2004) the main rivers in the municipality are as follows (main rivers size wise indicated in brackets):

- Blyde (main 2nd Catchment River) B
- Ga-Selati (main 2nd Catchment River) C
- Klaserie AB
- Makhutswi C
- Olifants (Primary Catchment River) D
- Tmbavati C

In addition to the main rivers stated by the SANBI B-GIS site, the rivers running from the escarpment on the western side of the municipality have been included because they originate from a key water strategy area and also because the demand for ecosystem services from these rivers is extremely high due to the large number of people living below the escarpment area (about 88% of the total Maruleng population of 94 000).

These rivers are:

- Molomahlapi AB
- Mounqwane Z
- Malhutswi C

Please note that the Present Ecological State (PES) rating symbols awarded to each of these rivers' status – as can be seen above by the symbol behind each river's name – comes from the National Freshwater Ecosystem Priority Areas (NFEPAs) (Nel, *et al.*, 2011). Table 4.5 below presents the ratings and what these ratings imply:

Table 4.5: Ecological River Categories (Nel, *et al.*, 2011: 51)

Present Ecological State category	
Symbol	Description
A	Unmodified, natural.
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
C	Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged.
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions have occurred.

E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions are extensive.
F	Critically/Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota; in the worst instances the basic ecosystem functions have been destroyed and the damage is irreversible
Z	Rivers C-F where no data and no expert opinion is available, modelled based on percentage natural land cover.

Of these rivers the most important ones – when relating to ecosystem services provided to the Maruleng area – are the last named three (smaller) and the Olifants River due to the high demand for river related ecosystem services by vulnerable and highly ES dependant people in the areas they run through. This one can gather when analysing the StatsSA census data of 2011 by ward level as done in the Ecosystem Services Demand section below. The quantitative data are backed up by some very good qualitative data, as well as with the interviews with seven Environmental Monitors (2014) living in the villages beneath the escarpment in which they mention the importance of these rivers and the ecosystems services provided to villages. Over consumption and unsustainable use is an issue though.

Dams and wetlands and general water supply

According to SANBI's B-GIS website (2018) the Maruleng area contains some 612 wetlands, dams and other waterbodies covering 1381.4ha (0.4%) of the Maruleng Municipal area. Wetlands often provide key ecosystem services to people such as filtering water, decreasing the flow speed of rivers and acting as flood control mechanisms during high rainfall scenarios. In Maruleng, according to an interview done with the Environmental Monitors (2014), it was confirmed that some villages close to the escarpment (Santeng and Willows) collect water from wetlands and dams in the area. The statistical data from the census of 2011 confirms this, as will be made explicit in the ES Demand section below.

The larger picture

When looking at the situation more systemically the importance of the Olifants and Ga Selati rivers (even though the latter only flows through the north western corner of the municipality) becomes evident when looking at downstream scenarios. The Olifants River runs through Maruleng to the Ba-Phalaborwa municipality and then enters the Kruger National Park –the effects of water usage and pollution is thus most important to control in order to help protect the pristine ecosystems situated in this icon of South African nature conservation. Further downstream the Olifants River enters Mozambique, and by international bilateral agreements South Africa needs to provide at least the Ecological Reserve Requirement to Mozambique, as well as ensuring that the water is of a certain

quality. In the same way the effects of upstream use also influence what happens in Maruleng, and upstream users have a responsibility to Maruleng's citizens. This is, however, problematic at present with the upper catchment of the Olifants being one of the most intensely mined areas in South Africa (Environomics and MetroGIS, 2009: 47) so much so that it has a Present Ecological State (PES) rating of D (argely modified river system that is not in a natural state anymore because of extensive alterations to water quality and quantity). A large loss of natural habitat, biota and basic ecosystem functions have already occurred before the most pristine river in the catchment, the Blyde River with a rating of AB, enters it in the middle northern area of Maruleng, improving its PES state to C through ensuring some dilution of the pollution happening upstream (Nel, et al., 2011: 5).

4.6.2 Ecosystem Service Demand

There are four main spheres of ES: Regulating ES; Provisioning ES; Cultural ES and Supporting ES. This section attempts to cover at least one or two most prominent of these spheres under this ES demand section for Maruleng.

4.6.2.1 Provisioning ES

Ecosystem service demand is not easily quantifiable, especially across a broad area – for this reason this provisioning section will only focus on specific aspects that have clearly quantifiable data that are also uniform across the spatial area of MLM. For this the census of 2011 (StatsSA, Census 2011 Superweb, 2014d-f) had some useful data. The three Provisioning Ecosystem Service demand categories looked at are as follows:

- Energy for heating
- Energy for cooking
- Water demand

In order to analyse these effectively at a ward level scale it was simplified into two main categories:

- Direct Local Natural Resource/Ecosystem Service Dependency.
- Other sources that are not of a direct nature.

These categories were chosen as they help create a clear line one can draw to better understand which is possibly vulnerable or not. Vulnerability in this instance focuses on the level of direct natural resource usage because people who are directly dependant on natural resources tend to be more vulnerable/less resilient to negative environmental drivers. This direct dependency needs to be more explicit in order to ensure that the spatial planning occurring takes their plight into consideration and makes room to incorporate their direct reliance on ES into the planning processes. Below is a chart

showing direct natural resource (ecosystem service) dependencies per ward for the three Provisioning categories (Heating, Cooking, Water Use) mentioned above. The number of people per ward, the number of people from that ward using a provisioning service and the percentage of direct natural resource dependency per ward is shown. The general pattern emerging clearly shows that wards around the escarpment, where the traditional areas are, indicate a tendency to have high natural resource (NR) dependency rates.

Table 4.6: Direct NR Usage per ward (Cooking, Heating, Water) (*StatsSA SuperWeb, 2014d, 2014e, 2014f*)

Ward	Total Ward Population	Direct NR Usage (Heating)	% of Ward Dependant on NR for Heating	Direct NR Usage (cooking)	% of Ward Dependant on NR for Cooking	Direct NR Usage (Water Source)	% of Ward Dependant on NR for Water
1	5471	596	11%	613	11%	2077	38%
2	8219	4240	52%	4682	57%	4979	61%
3	6859	5562	81%	5966	87%	3560	52%
4	6298	2894	46%	5760	92%	3048	48%
5	5927	5022	85%	5509	93%	3334	56%
6	7187	5446	76%	5672	79%	6340	88%
7	6183	4640	75%	5625	91%	4538	73%
8	7668	6939	90%	7014	92%	7092	92%
9	6368	3667	58%	3760	59%	823	13%
10	6647	4548	68%	5388	81%	4944	74%
11	8792	5463	62%	7049	80%	3953	45%
12	8259	4108	50%	5974	73%	3980	48%
13	6084	4070	67%	5160	85%	4493	74%
14	4659	3393	73%	3565	77%	2207	47%

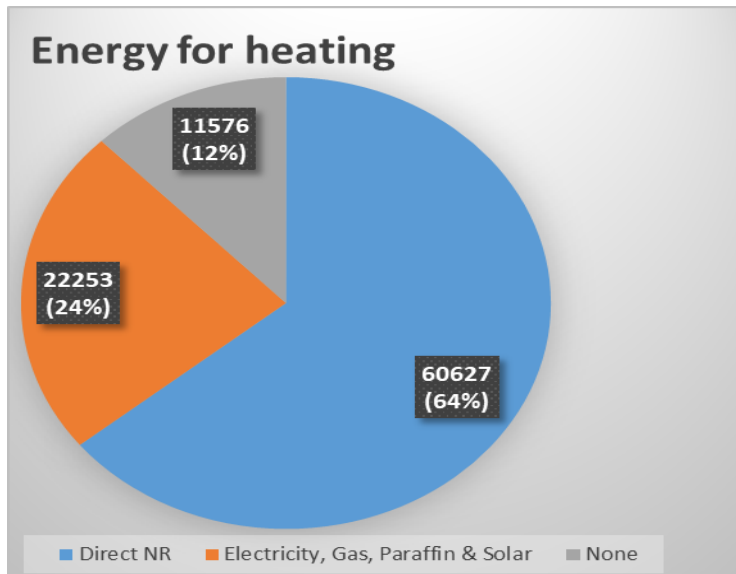
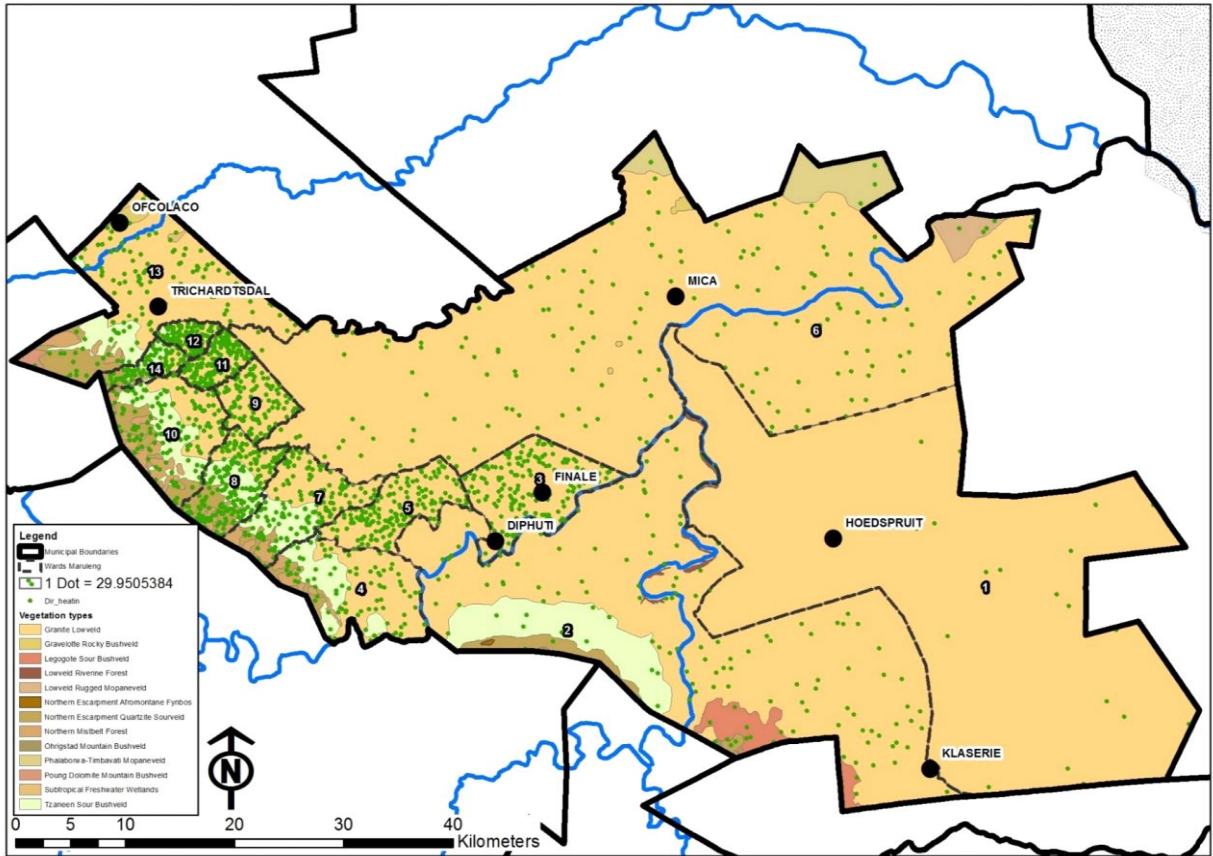
Energy for heating

Figure 4.9: Energy used for Heating – Entire Maruleng (*StatsSA SuperWeb, 2014e*)

Direct NR in the figure above refers to direct consumptive natural resource usage. Of the 60 627 people in Maruleng which fall in the Direct NR category, 60 567 use firewood and in the electricity, gas paraffin and solar category the vast majority uses electricity (21 356). There is quite a large number of people in the municipality that do not use any form of heating – this is due to the temperate climate, thus there is no demand with also a possible lack of resources causing some people to simply not have access to any source of heating.

Below is a Dot Density map representing the direct natural resource usage dependency on ES such as firewood and animal dung for heating purposes in the Maruleng area. Each dot on the map represents 30 people directly utilising natural resources for heating purposes. The Dot Density was overlaid with the vegetation types occurring in the area to give an idea of what type of vegetation type supports the demand for direct NR usage (which consists overwhelmingly of firewood usage). The densities were done according to ward level, with a clear, massive demand for all the wards (3-14, bar ward 6) along the escarpment where the traditional areas are found.



Map 4.10: Dot Density ES Demand Map for Maruleng, per wards- Energy for Heating (Researcher, 2019)

Energy for cooking

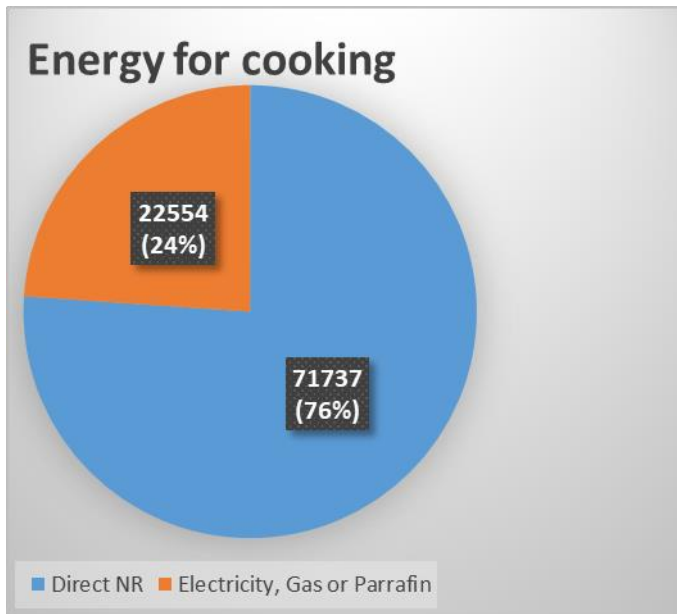
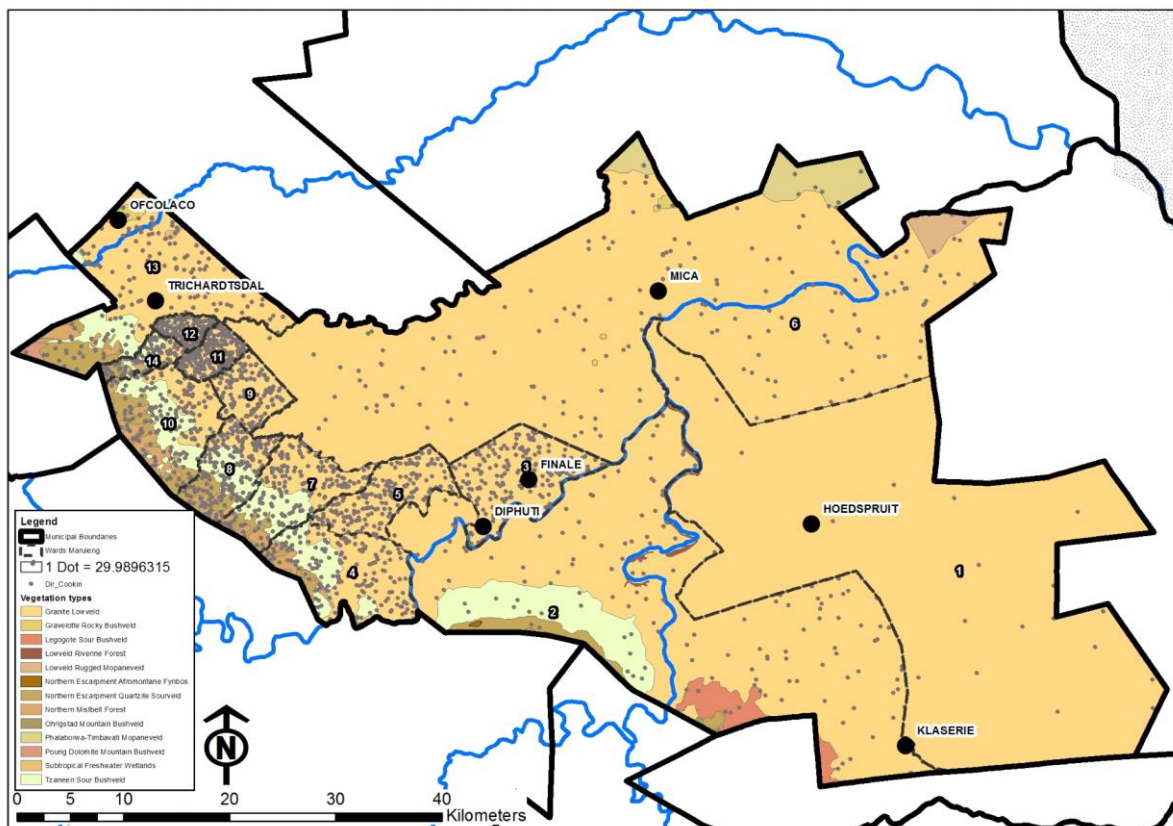


Figure 4.10: Energy for Cooking – Entire Maruleng (StatsSA SuperWeb, 2014d)

Similar to the abovementioned energy for heating section the Direct NR category contains wood and animal dung as sources, with wood making up the greater majority of this (71 523) primary consumption pattern. Below is a Dot Density map (StatsSA Superweb, 2014d) representing the direct natural resource usage dependency on ES such as firewood and animal dung for cooking purposes in the Maruleng area. Similar to the abovementioned Energy for Heating section, the biggest demand lies in the traditional areas along the escarpment. The fact that the vast majority of the population resides in that area may, however, create a disillusionment with the percentage of people of the area actually dependent when analysing the data at ward level, hence the inclusion of Table 4.6. It indicates the percentage of people of each ward dependent on natural resources. An example here is ward 8 where 92% of the residents are directly dependent on direct natural resource usage for cooking. It is a ward in a serious state of vulnerability with its people also 90% dependent on direct natural resource usage for cooking and 92% for water. From a spatial planning perspective, it makes this ward extremely important to understand as a whole SES, as all development around that area will have to be done in such a way as to not disturb the ability of the natural environment to produce ES on which these extremely vulnerable people are highly dependent.



Map 4.11: Dot Density ES Demand Map for Maruleng, per wards - Energy for Cooking (Researcher, 2019)

Water demand

Only a limited number of people receive piped water in the MLM area, thus showing a strong direct dependence of the people of the municipality on the rivers, wetlands and dams in the area. The largest dam in Hoedspruit is the Klaserie dam which was traditionally used for agricultural purposes. Because of the area being a quarantine zone for buffalo, its lack of fertility and profitability of wildlife and tourism, farming in the area was halted (Diphororo Development and LEDET, 2013: 57). The aforementioned major dam, as a form of ES supply, is, however, far from where the biggest demand for direct water utilisation lies (the western escarpment area). Hoedspruit, the economic and administrative hub of the area, receives water from the Blyde River. The municipality's water management schemes are, however, struggling at the moment according to interviews (Du Preez, 2014; Uys, 2014).

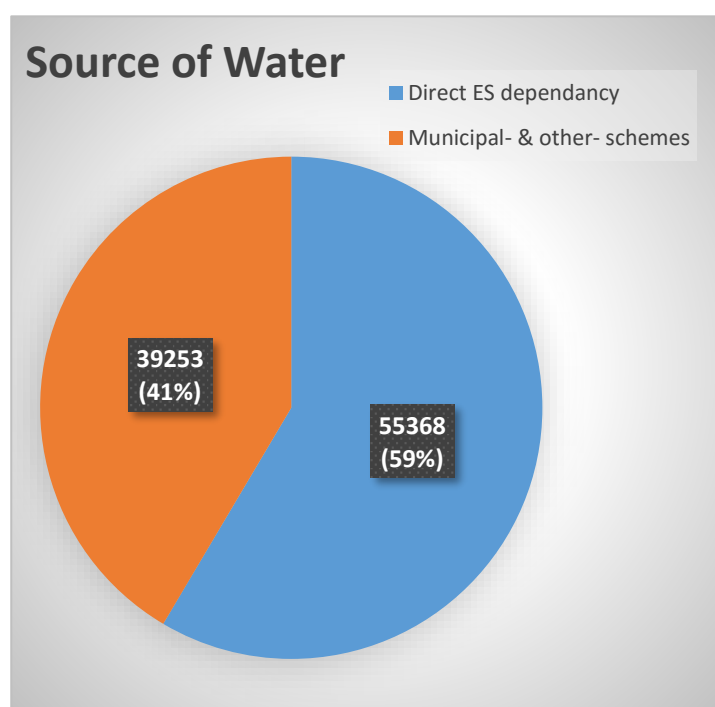
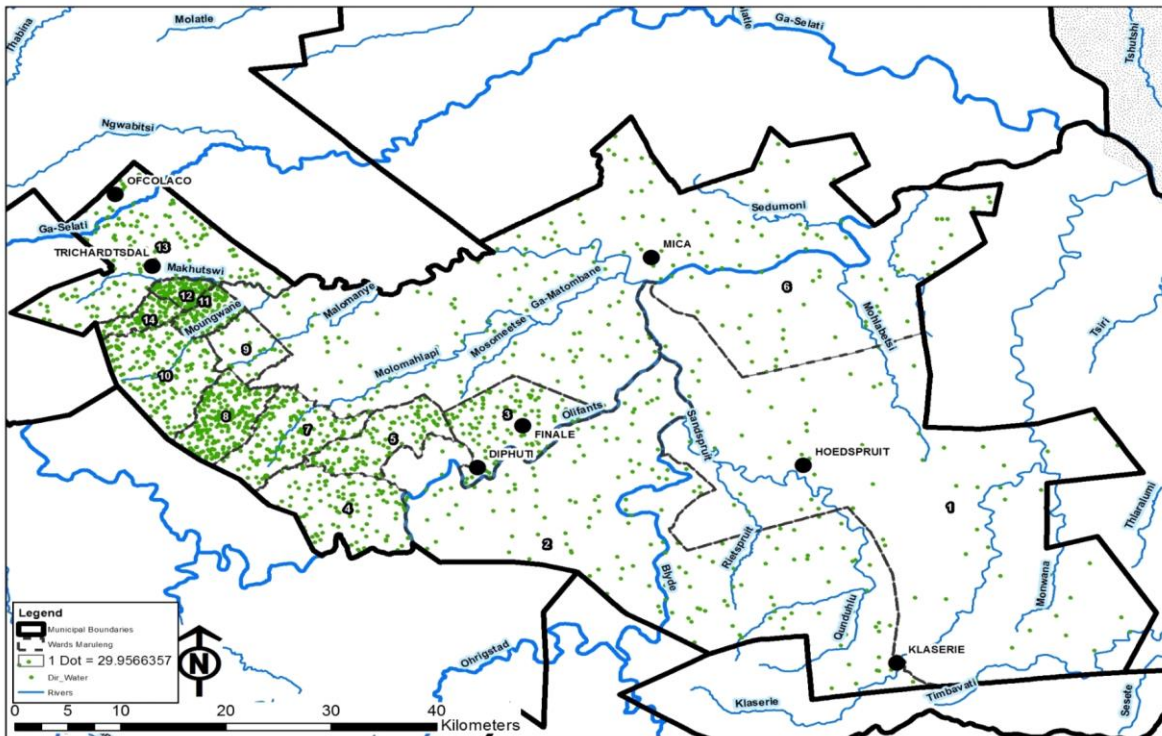


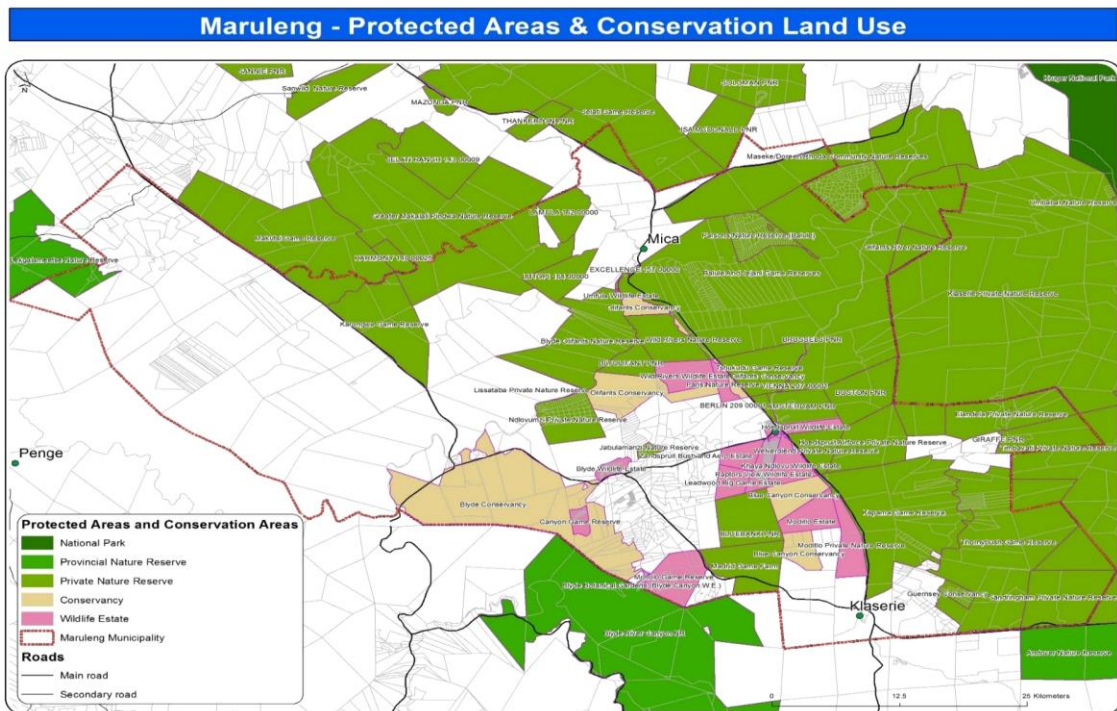
Figure 4.11: Source of Water – Entire Maruleng (*StatsSA SuperWeb, 2014f*)

Figure 4.11 above depicts what source of water is being utilised by the people of Maruleng. For the purpose of this research it has been divided into Direct Ecosystem Service Dependency and Municipal and Other Schemes. The latter consists of resources taken directly from the environment on a regular basis, including water from boreholes; rain tanks; rivers; stagnant dams and springs. The latter consists of water from municipal schemes, vendors and tankers. As figure 4.11 shows Direct ES dependency for water lies at 59% for the municipality's population. This is a substantial figure – from the map below spatialising where most of these people and their demands lies. The map highlights natural resource dependency for water needs in the informal villages below the escarpment.



Map 4.12: Dot Density ES Demand Map for Maruleng, per wards – Direct Natural Resource Dependency for Water Usage (Researcher, 2019)

4.6.2.2 Protected areas as a cultural ES



Map 4.13: Protected Areas and Conservation Land use (Holness et al., 2014)

Protected areas (PA) are in high demand for ES because they are one of the main platforms with which Cultural ES demand (in the form of wildlife experiences) is met in the Maruleng area. Above (see map 4.13) of the protected area and conservation network within and bordering on Maruleng Municipality. These areas have been ground-truthed and mapped by AWARD (Holness *et al.*, 2014: 3 – 4) as input for Maruleng Municipality's updated SDF document. The different types of PAs are indicated as they offer a clear indication of the economic beneficiary types emerging from it as a form of cultural ecosystem service. PAs are more prominent on the eastern side of the municipality due to the high population densities on the western side, creating different land use scenarios, as well as the PAs mostly being east due to the close proximity of this area to the Kruger National Park. As discussed in the economic section of this contextual analysis the PAs are the dominant driver of tourism, contributing a great deal to the local economy (Quantec, 2015).

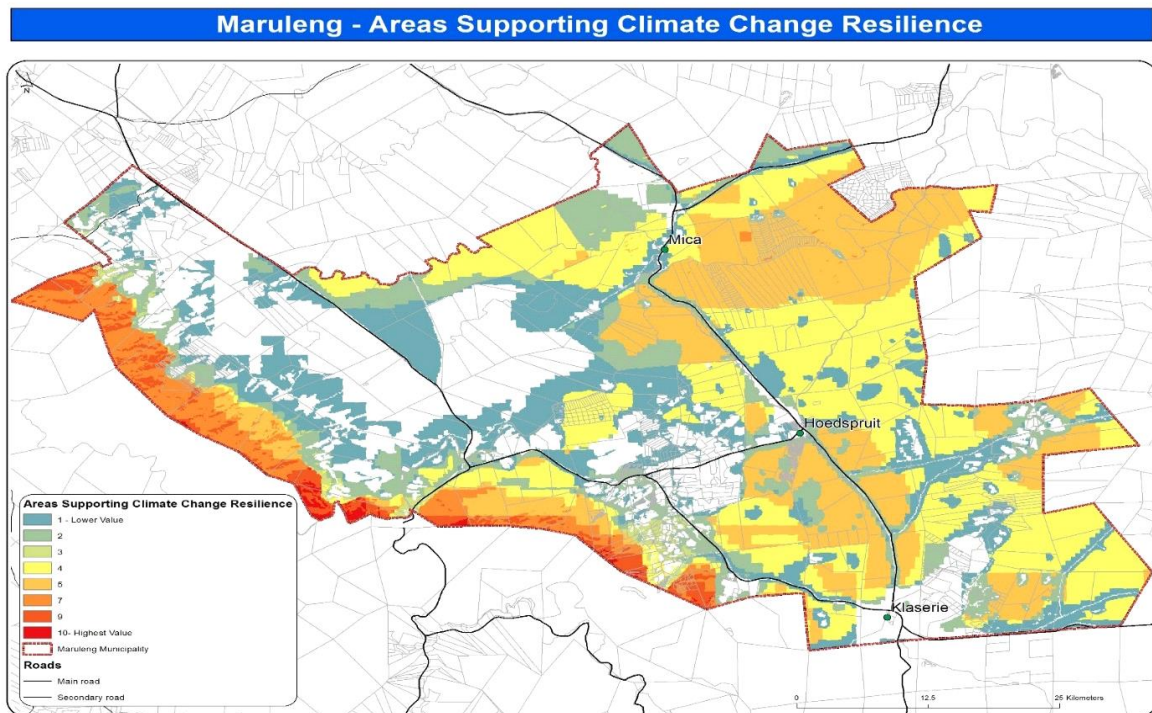
The different types of protected areas all contribute to the economy through different land use purposes. Below is a very brief summary of what each of these contribute:

- National Parks and Provincial Nature reserves: These are fully protected areas which provide ES and beneficiation through mainly tourism, but also in other ways such as the selling of game.
- Private Nature Reserves: These are the main drivers of the tourism industry in Maruleng, and also the most prominent form of PA in Maruleng as indicated in the PA map above. The area has many upmarket private nature reserves that cater mainly for international tourists. Some limited hunting may also occur in these areas in order to help keep game numbers in check.
- Conservancies: Conservancies are declared as being able to have a wide variety of land use activities, from tourism to hunting, and in some instances, such as that of the Blyde Conservancy on the eastern side of Maruleng, acting as game breeding areas.
- Wildlife Estates: Wildlife estates present a new type of development quite unique to the Lowveld area, with Maruleng having some 20 such estates. No academic writing could be found on wildlife estates, but Holness *et al.* (2014: 3) describes them as informal protected areas (not necessarily having a formal proclamation status), with residential land use value included by way of having housing plots available (varying in size from 0.5 to 21 hectares). Wildlife estates have similar characteristics to those of the better well-known golf estates and gated communities found throughout South Africa. It is usually a fenced area containing game, from basic antelope and other herbivores (as for example in the Hoedspruit Wildlife Estate) to more upmarket types like Leadwood which has four of the big five (lion, leopard, elephant and rhino) on it. Wildlife estates are similar to, and possibly originated from share blocks, which are pieces of land up to 21 hectares in size, with housing, and owned within a nature reserve by private

owners. For tourism the wildlife estate's role is yet to become clear through resorts such as Zandspruit Aero and Bush Estate (has its own runway for aircraft) which represent the trend of being a getaway for people wanting to escape the bustling city life to a "wildlife haven" in the Lowveld where, of course, Maruleng is nestled. Moreover, these wildlife estates have several lodges that are a major boost to the tourism industry in the area in that they offer accommodation for overnight stops (Maila, 2014).

4.6.2.3 Climate change resilience as a regulating ES

Climate change is a major driver in the Lowveld area. It is predicted that the area will be considerably affected by climate change with some experts expecting possible temperature rises of up to >2 °C in the future, according to Faling *et al.*, (2012: 243). It is also said that the area will become drier in the winter months and wetter in the summer months, thus receiving more rain overall, especially around the areas with high altitudinal differences, such as the escarpment around the western border of Maruleng (AWARD, 2014b: 14). Hence climate change becomes an ecosystem service for which the demand will probably increase rapidly in the near future, and for this reason it was included in this study. Below is a map that highlights areas around Maruleng that will promote resilience to climate change if in a natural state. The warmer the colour the more resilient an area will be to climate change and vice versa. It is clear that the escarpment will probably play an important role, due to the variations in altitude occurring there, whilst the north-eastern area, where there are several private game reserves, also acts as an important buffer area that would be less affected by climate change.



Map 4.14: Areas Supporting Climate Change Resilience (Holness et al., 2014)

The areas that could support climate change were chosen considering the criteria as in table 4.7 below, as guided by a national study done by Driver et al. (2012) for the National Biodiversity Spatial Assessment.

Table 4.7: Key Features Promoting Climate Change Resilience (Driver et al., 2012: 116)

Key Feature	Reason
Riparian corridors and buffers	Increases connectivity in landscape
Areas with important temperature, rainfall and altitudinal gradients	Provides the shortest possible movement paths as required for a species or ecosystem to remain within its acceptable climate range
Areas of high diversity	These are areas where relatively high numbers of biomes, vegetation groups or vegetation types occur in close proximity, which supports biodiversity's adaption capacity
Areas of high plant endemism	These are areas where species have survived previous eras of climate change, and hence are likely to be very important for supporting future biodiversity adaptation capacity. Generally these areas also contains a high diversity of species, many endemic to the area concerned
Refuge sites (including south-facing slopes and kloofs)	These sites tend to be wetter and cooler than the surrounding landscape, and represent key shorter term refuge which allow species to persist in regions

Priority large unfragmented landscapes	These include existing protected areas as well as large areas identified in the National Protected Area Expansion Strategy. The ecological processes which support climate change adaptation are more likely to remain functional in unfragmented landscapes than in fragmented ones.
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Areas received highest scores where a number of these features overlapped, lower scores where there was not much overlap and no score where specific features supporting resilience to climate change impacts were not identified. Looking closely at this map the high importance areas lie all along the escarpment. This area provides much climate change resilience because of:

- The gradient changes found in the area with regards to important temperature, rainfall and altitudinal gradients.
- It being an area of high ecosystems diversity and biodiversity importance.
- It having prominent refuge sites and having been untouched by development, thus acting as an unfragmented landscape.

It is important to note that Maruleng (as being part of Mopani District Municipality) is prioritised for a climate change study by SANBI in 2016. Mopani and another district municipality in the Northern Cape have been selected for this process that also includes a vulnerability study according to an interview with Manoko (2015).

4.6.2.4 Carbon sequestration as regulating ES

With the majority of the Maruleng municipality being under natural savannah vegetation an important, less direct ecosystem service, carbon sequestration – although not quantified yet – is also a very important part of what the mainly natural state of Maruleng provides its people. Quantifying this accurately would be highly time and skill intensive, but instead a rough sum has been made, using the assumption that the carbon sequestration level of the savannah found in Maruleng is similar to that found in an area in northern Australia where a carbon sequestration study has actually been done. This three year study from 2001 to 2003 in the Howard Springs ecosystem in Darwin revealed that per hectare the savannah found in that area was able to absorb more or less 2 (2.3 during the wet season and 1.4 during the dry season) tonnes of carbon per hectare per year. This number was calculated in the carbon absorption from vegetation and soils and the emissions of plants, animals, and the veld fires frequenting the area (Chen *et al.*, 2003: 409). The savannah is similar to that of the Maruleng area in some sense, but contains less shrub and bushes, having more trees and grass. The area is also less intensively grazed than the savannah found around Maruleng. These are prominent differences but the fact is that this calculation is done on a very broad scale to simply attain a modest idea of what the possible levels of carbon sequestration could hypothetically be. This drive to quantify the ES

emanated from several people in interviews, including Kruger (2015), Biodiversity Manager from LEDET, who mentioned the need for making the value of ecosystems more explicit if progress is achieved with influencing key people in government to raise awareness with policy and planning decision makers, and if better integration of an ecosystems focus into the local municipal spatial planning level is to become a reality.

According to a rough calculation based on savannah carbon sequestration done by Chen, *et al.* in 2003, a substantial amount of 628 789.2 tonnes of carbon is absorbed by the 96.91% of Maruleng's land area covered by savannah per annum.

The three main shortcomings of the calculation for the derived amount of carbon absorbed, is as follows:

- It is not measured against other land use types, thus there is no idea whether savannah actually does allow for better carbon sequestration per hectare than for example the citrus plantations found in the area.
- Many variables will differ between the two savannah types (animal occurrence – livestock and indigenous; rainfall patterns and soil fertility; plant type and abilities to absorb carbon, as well as fire frequency).
- The SANBI B-GIS data indicates that 96.91% of the land is covered by savannah but this clearly does not include altered land (i.e. farming land, built up land and so forth).

4.6.2.5 Agriculture as supporting ES

Agriculture is sustained by several types of ES, but most prominent is that emanating from the Support ES category, such as nutrient cycling and pollination. The Maruleng agricultural sector is delineated below into the most prominent agricultural households by category. According to Malepe, (2014) and Fhatanani Management Services (2013: 43) the two largest sectors, namely Livestock production and Poultry production are both mainly subsistence-based, showing the large direct dependency of the vulnerable on ES such as grazing for animals. Production of other crops and vegetables are largely done by commercial farmers, with the Maruleng Municipality (2014a: 14) promoting the area as a major producer of export mango and citrus.

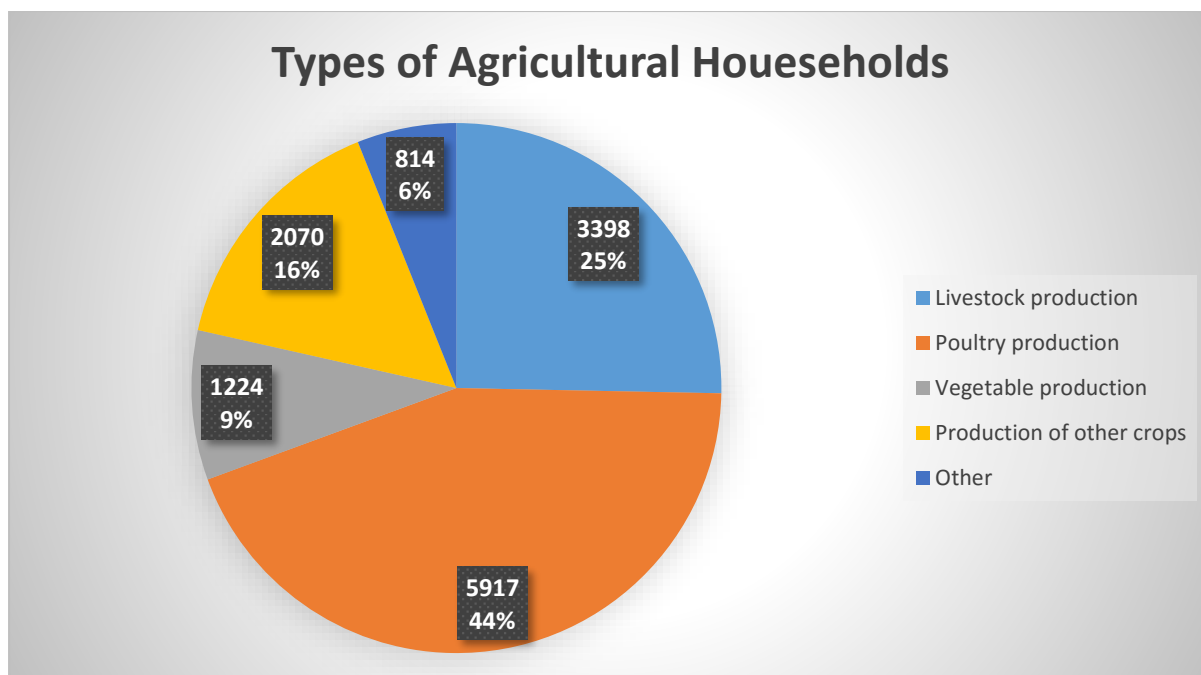


Figure 4.12: Types of Agricultural Households (StatsSA, 2012)

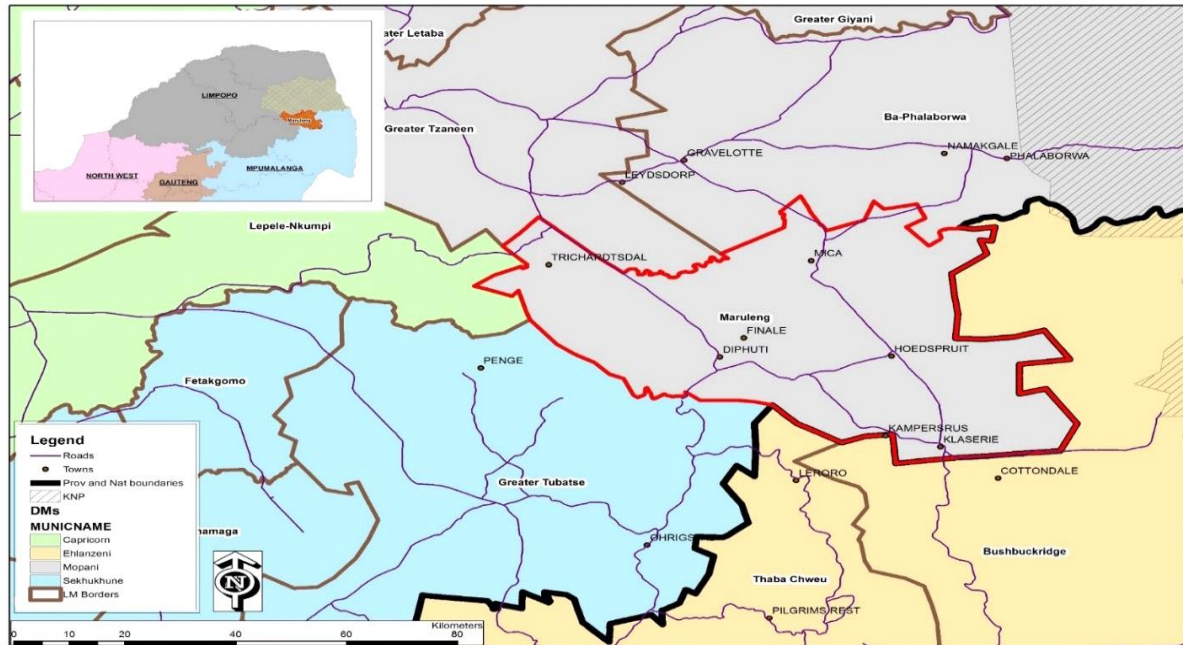
4.7 POLITICAL

4.7.1 Boundaries

Maruleng is the southern most of the five local municipalities in Mopani District Municipality, situated on the eastern side of Limpopo (Aurecon, 2014: 4). To the east of Maruleng lies Mpumalanga and more specifically Bushbuckridge Local Municipality which in terms of land use consists almost entirely of private nature reserves – further east lies the Kruger National Park. The part of Bushbuckridge Municipality, bordering south of Maruleng, is a former Apartheid Homelands area and is thus heavily populated with rural communities, with the Bushbuckridge area stretching down to Hazyview, containing over half a million people (Bushbuckridge Local Municipality, 2012: 23). The Ba-Phalaborwa and Greater Tzaneen Municipalities (both in Mopani) border Maruleng to the north, Lepelle-Nkumpi Municipality to the west, and the Greater Tubatse Municipality to the south west – both are part of the Greater Sekhukhune District Municipality of Limpopo. The Greater Sekhukhune area to the west and southwest was once also former Apartheid homelands with large rural communities (Sekhukhune District Municipality, 2012: 16). The border between it and Maruleng is the Drakensberg escarpment with Maruleng completely nestled in the Lowveld below the escarpment.

The area, however, has a platinum belt running from the south west in a half circle shape up to the Penge area in Greater Tubatse on the map below (Map 4.15), which will possibly see some large scale development in the future if markets are favourable. This is mentioned because it may have some possible effects on the water quantity and quality of the Olifants River running into Maruleng (which

provides various ecosystem services to several communities) (Environomics and MetroGIS, 2009: 53). Ba-Phalaborwa to the north has Phalaborwa as its main town and known for tourism and mining with the latter in particular creating systemic problems for the Maruleng area – as was discussed in the Technological section.



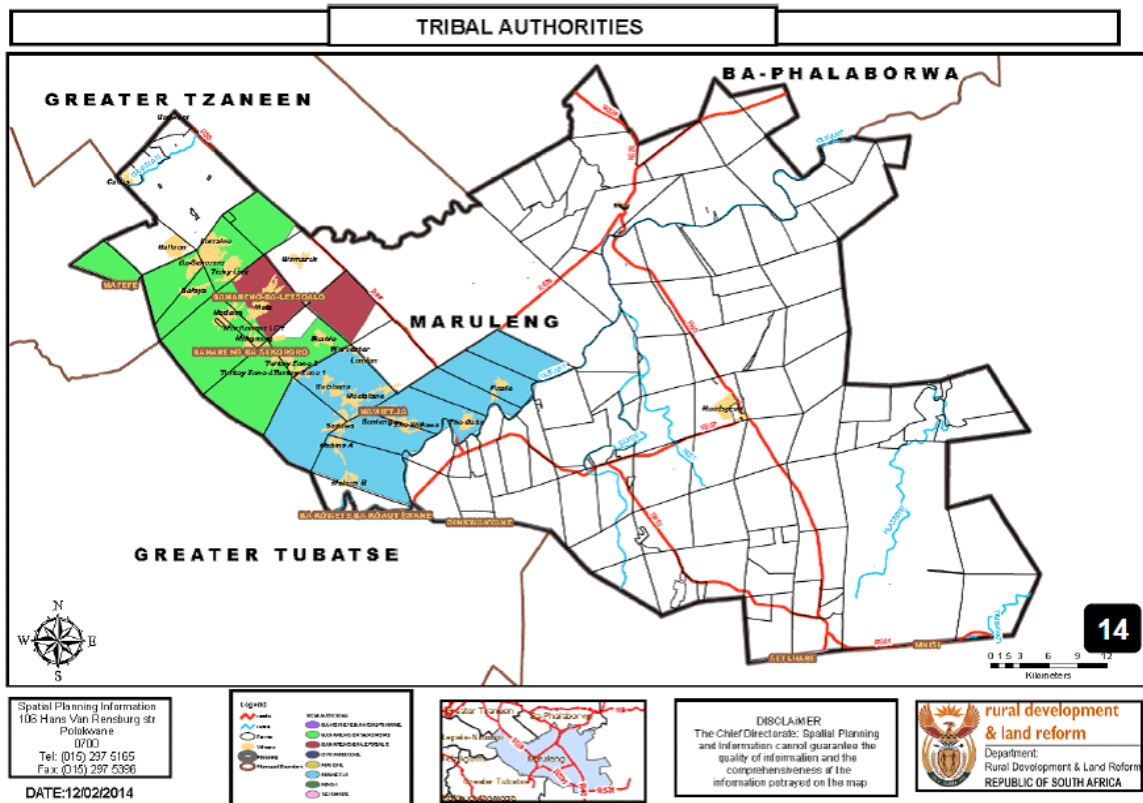
Map 4.15: Political boundaries around Maruleng (Researcher, 2019)

4.7.2 Authorities

The headquarters of Maruleng Municipality is located in Hoedspruit, the main town of Maruleng, in the western part of the municipality. The municipality, however, being situated where it is, creates a situation where it is only able to provide limited services to communities in the farther (western) reaches of the municipality, increasing direct dependency on natural resources and thus bringing vulnerability to environmental degradation. This lack of service delivery has been experienced as a repetitive issue throughout all the public participation processes attended with regards to Maruleng Municipality (Maruleng Municipality, 2014b, 2014c).

Maruleng is also home to several traditional authorities, such as the Sekhororo Tribal Authority (Green in Map 4.16) in the north western parts, and the Mametja Tribal Authority (Blue in Map 4.16) in the mid-western part, whilst a smaller Tribal Authority, the Letsoalo's (Red in Map 4.16) also exist around the north western area. These authorities play an important role in the communities even though they are outside the formal government spheres. They could play a key role with regards to guiding communities into better land use management and planning processes that could help preserve the production of key ES (Manoko, 2015; Steenkamp, 2015), as was discussed in more detail in the

institutional overview (chapter 3). Their role is also evident from literature with the K2C EMF (Diphororo Development and LEDET, 2013: 23) stating that the land in the rural villages is often managed and divided for subsistence farming and developmental purposes by the local authorities.



Map 4.16: Tribal Authorities (Plan Associates, 2014: 30)

4.7.3 Land claims

Land claims is a major driver of spatial land use planning and management. Maruleng’s IDP (Maruleng Municipality, 2014a: 31) states that large areas in the north western, central, north eastern and south eastern parts of the municipality are affected by land claims. It is portrayed negatively because it often occurs that areas that come under claim, are degraded due to the knowledge of the owners that the land will be lost to claimants. Another negative element of this dual sided sword is that when an area exchanges ownership, the new claimants/owners often do not have the capacity to maintain the levels of ES production – with assistance from government’s side being severely limited most of these areas, due to mismanagement, stop producing the optimal amount of ES linked to the basic constituents of well-being through agricultural practices. The literature is supplemented with evidence from an interview with Malepe, (2014), who comes from and works on the K2C Biodiversity Social Project run in the area. She revealed that a part of a citrus farm, claimed just north of the Oaks area, provided many people with work prior to that, but after the claims and land transfer the area fell foul to mismanagement, resulting in several job losses. This is an example of attempts to spread the benefits

of ecosystem services, but in the process destroying the ability for the area to produce these ES because of mismanagement, and according to Uys (2014), also due to a lack of guidance and financial support needed by the local people to ensure better beneficiation. Hoedspruit, as can be seen in the table 4.7 below, has 21 claims of which 5 have been settled. Most of these claims are from the Moletele Communal Property Association (ref 4028) who originally came from the Bushbuckridge area to the south and the Sekhororo (ref 2089) Tribal Authorities. Other claimants include the Mpuru Letebele (ref 5346); Mokgwanatjane (ref 836) and Baropodi Ba Moraba (ref 1453).

Table 4.7: Land Claims (*Maruleng Municipality, 2014b: 31*)

Total number lodged	21
Total after consolidation	20
Total settled	5
Hectares restored	16 702.25
Households benefited	2820
Beneficiaries	19 492
Claims outstanding	16

The authorities under which these lands are claimed, are important to involve so to ensure that improved spatial planning and land use management processes occur in order to ensure the most sustainable utilisation of ES. With the original land claims window that closed in 1998, and was reopened through the Restitution of Land Rights Amendment Act from 2014 to 30 June 2019, the beneficiation around the ES produced through land claims for the Maruleng area – as a prominent land use management and planning driver – is going to be an interesting lead to follow (Vecchiato, 2014).

4.8 CONCLUSION

The purpose of the contextual analysis (VSTEOP Overview) of Maruleng was to create a better understanding of the SES context within which the area functions. With that done the next step in the process will be to explore how this understanding (together with that what the institutional mechanisms from the previous chapter are) can help improve the chances of uptake of ecosystems and the ES it provides for the spatial land use planning processes. In the literature search for the data to provide the input into the above process, it became clear that currently the only data really utilised by MLM (through their planning documents), still has a very linear approach that – in silos – produces limited information. The abovementioned overview is by no means exhaustive in its attempts to understand the systems and their interconnectedness better within Maruleng, but it does create a

much more informed picture, which starts to make more explicit the connections between the ecosystems, development and HWB. An example of this is the clear picture created around the dire socio-economic scenarios the traditional areas near the escarpment are confronted with, and how that perpetuates their direct natural resource usage dependency. Without taking a systemic view and contextualisation, problems such as these are often much harder to deal with. However, creating a better informed picture allows the municipality to now spatially plan for better protection of the land and the natural resources these people rely on so heavily, in order to increase their resilience.

CHAPTER 5: EXPLORING THE POSSIBILITIES OF TAKING AN ECOSYSTEMS APPROACH TO SPATIAL LAND USE PLANNING

5.1 INTRODUCTION

The contextual analysis (VSTEOP Overview) chapter has created a good understanding of the SES system, particularly helping to highlight the complex relationships between the people of the area and their dependency on the ecosystems and ES which they are provided. Many of these dependencies are direct whilst others are indirect. It was clear though that the large majority of the vulnerable population directly utilise healthy ecosystems for basic necessities such as water consumption, cooking and heating purposes. This plays out in the shadow of a lack of basic service provision and economic opportunities. Moreover, the primary economic drivers in the area (the wildlife economy and agriculture) are also heavily reliant on the natural environment. The Institutional Arrangements chapter (chapter 3) highlighted that there are some excellent opportunities to assist the people of Maruleng to maintain resilient ecosystems by means of effective spatial land use planning. This chapter will discuss the possible avenues for promoting a more ecosystems-inclusive spatial land use planning system and whether the theoretical framework outlined in chapter 2 can be of help in achieving this, in the light of the limitations and opportunities highlighted in chapter 4.

5.2 MOVING AWAY FROM ENVIRONMENTAL AND BIODIVERSITY PLANNING TO A SYSTEMIC ECOSYSTEMS APPROACH IN ORDER TO PROMOTE THE RESILIENCE OF MARULENG'S ECOSYSTEMS

Currently broader level environmental planning focused on land use is primarily implemented through the NEMA (RSA, 1998a), NEMBA (RSA, 2004a) and NEMPAA (RSA, 2003) acts in South Africa. These Acts all have various land use and broader environmental management focused tools emanating from them. The legislation comprises well conceived documents, although an argument could be made that the purpose and desired outcomes of the legislation compared to its outcomes with regards to securing ecologically important land, are disparate. This emanates from the general government issue of acts being high level regulatory frameworks that cannot be implemented effectively at ground level due to a lack of capacity within government structures (Ruwanza and Shackleton, 2015).

Under NEMA (RSA, 1998a), the main implementation tool focusing on securing land important for ecological functions, is the Environmental Management Framework (EMF), for which guidelines were gazetted in 2010. Its purpose is to provide environmental information for any environmental authorisation applications in its geographical area. The EMF thus acts as a guideline for reactive land

use change, having no real bite to ensure certain areas are planned for and managed in an ecologically sound way (DEA, 2010). This becomes clear through the perceived lack of usage of the Olifants Letaba Environmental Management Framework in the Hoedspruit area, with the EMF having become another *“report on a shelf that very few planners even know about”*, according to Uys (2014). NEMBA (RSA, 2004a) has a similar tool, the Bioregional Plan, for which guidelines were gazetted in 2009. The Bioregional Plan was conceptualised as a tool with which to prioritise the conservation of important biodiversity areas outside of protected areas (DEA, 2009). It is a more proactive tool that attempts to prioritise certain areas being conserved even before land use changes occur. Both these tools act as frameworks that are considered by national and provincial environmental authorities as important to help inform the spatial planning sections of local municipalities. They have, however, been conceptualised and created without the proper participation and consultation from development orientated departments such as the South African Local Government Association; the Department of Cooperative Governance and Traditional Affairs and other departments that are focused on assisting local municipalities with their spatial land use planning and implementation. Due to this silo approach these documents, if created, seldom feature in the municipal planning structures, as indicated by Vromans (2015) in her review of the level of biodiversity incorporation into local municipality planning documents in the Olifants Catchment Area. Regarding Maruleng this becomes very clear when taking a closer look at what tools have been developed and how they are represented in the IDP, SDF and LUMS of the municipality. Local municipalities are the key planners for land development, especially after SPLUMA (RSA, 2013) cemented this position and decentralised the powers allotted to them even further. NEMBA (RSA, 2004a) realises that, as Bioregional Plan Guidelines (DEA, 2009), the information they hold is intended to be fed into the SDFs and IDPs of local municipalities, but often no proper engagement processes are followed with municipalities to ensure the plans are understood and utilised (Holness, 2014).

Both the Environmental Management Framework and Bioregional Plan tools are seen as guidelines to help inform spatial land use planning at local municipality level around key environmental and biodiversity features. It devolves the objective of implementing the various sets of environmental and biodiversity datasets into planning to local municipalities through their spatial land use planning processes. This is a great initiative to help break down the silo approach to planning, and promotes the notion of increasing the resilience of the planning system by promoting a polycentric governance approach, as well as increasing the interconnectedness of government sectors. These plans are in the end only as good as the relevant municipalities (as implementers) in promoting planning that helps secure areas of ecological importance. In the context of rural municipalities in South Africa this does

create issues, as these institutions are often so under capacitated already, that adding the burden of ensuring environmental aspects are considered in spatial land use planning is just not viable. In Maruleng this is clearly evident with very limited recognition of environmental features in the IDPs and SDFs analysed in chapter 3. This despite the fact that Limpopo does have the Limpopo Conservation Plan v2 (2013), also there is an Environmental Management Plan for the Kruger 2 Canyons Biosphere (2013) and an Olifants Letaba Environmental Management Framework (2009), with Maruleng municipality being completely within the Kruger 2 Canyons Biosphere and Olifants-Letaba Catchment. Not one of these documents were mentioned anywhere in the IDPs analysed. The latest Maruleng SDF (2014) analysed did, however, mention Critical Biodiversity Areas and Protected Areas, but only through the active intervention of an NGO. The issue at stake is the lack of the presence of an Adaptive Management approach, prioritising feedback loops feeding information on where these plans which have been created, are being utilised. Without effective feedback loops helping the environmental authorities better understand that their plans are not being incorporated into a local government development planning process, the system is set up for failure in a rural context.

Through attendance of various public participation processes held by Maruleng municipality over a six-month period (April – September 2014), as well as several interviews, a deeper understanding was created of the context of the area and how the governance systems work in the Municipality. One of the specific aims was to create a better understanding of the current level of blockages related to land use planning and the levels of biodiversity, environmental or ecosystems planning processes it holds. This was done in order to supplement the findings of the literature review in order to further explore the reasons behind the shortfall thereof in their planning processes, as emergent in the institutional review in chapter 3. According to Uys (2014) the municipality is dependent on various local government programmes to help supplement its income because of its rural setting and the service delivery backlogs in the previous Apartheid Homeland areas beneath the Drakensberg escarpment on the western side of the municipality. A dependency on local government programmes indicates a lack of financial viability and sustainability. A lack of financial resources should not be seen as the most important factor influencing the functionality of a municipality, but it is a root problem that causes the emergence of several other complications. It is especially an issue when looking at fiscal incentives models such as the municipal rebates potential for protected areas as set out in Section 17 (1) (e) of the Municipal Property Rates Act (RSA, 2004b), stating that, inter alia, property rates are impermissible for NEMPAA Section 18; 20 and 23 protected areas. These incentives could promote the conservation of key land parcels because of the ecosystem services they provide but would potentially meet resistance because it would decrease the amount of revenue brought in through land

taxes by an already overburdened, external funding dependant, municipality. With regard to the lack of financial resources several other issues were picked up, including a lack of capacity related to skill sets, with Maila (2014) stating that Maruleng municipality does have a person employed as an environmental officer, but that this person focuses more on occupational health and safety related issues rather than environmental issues. Moreover, there is also a lack of capacity related to the number of employees and time they can allocate to duties other than what is stated in their key performance areas – this is due to being overburdened by heavy workloads. An example in this regard is that the Municipality has two spatial planners who do not have the time to take up ecosystems or biodiversity planning processes. According to Anonymous (2014) the same scenario is evident in the Mopani District Municipality, meaning that their ability to provide assistance to Maruleng in this regard is very limited. The questionnaires done with various participants from the area also reflected a similar scenario, as can be seen in Figure 5.1 below, the levels of concern regarding the degradation of key ecosystems are very high amongst the participants in the questionnaire, whilst the levels of perceived interventions taking place to help reduce this degradation of key ecosystems is very low.

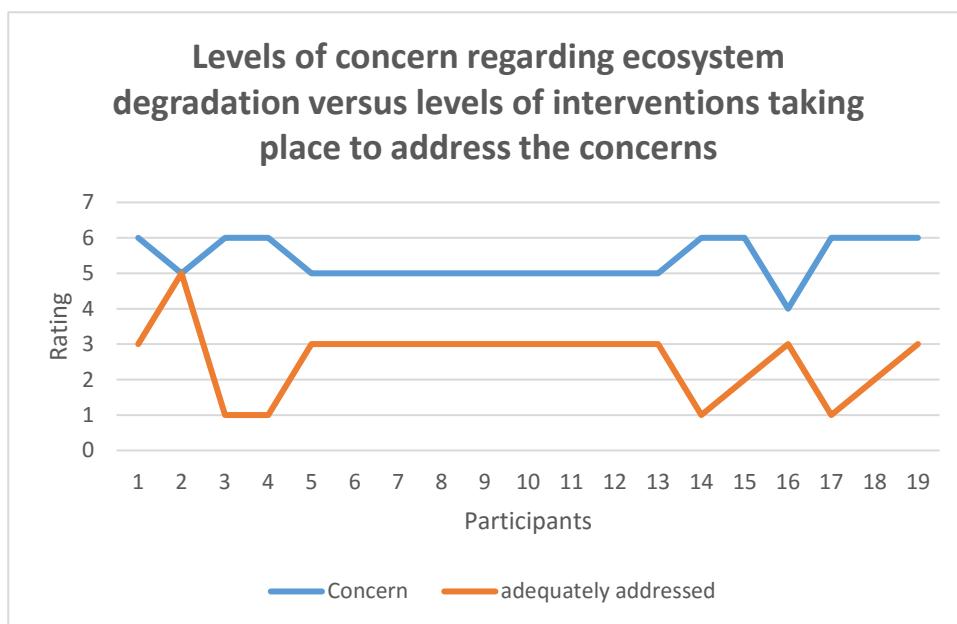


Figure 5.1: Levels of concern regarding ecosystem degradation versus levels of interventions taking place to address the concerns (Researcher, 2019)

There should be no misconceptions around the scenario facing rural municipalities such as Maruleng which have previous Apartheid Homelands in its boundaries. They are often totally under-financed and under staffed whilst being burdened with the immense task of redressing massive socio-economic inequalities and service delivery backlogs. Allocation of the limited amount of resources available would thus be expected to prioritise addressing these issues through a developmental approach that

shows tangible benefits immediately (i.e. number of houses provided with electricity connections). This type of linear thinking is done away with in favour of more systemic approaches to address complex problems when using Adaptive Management, and is therefore seen as the best tool with which to promote an ecosystems planning approach. Yet, within the rural municipality context such an approach may be difficult to mainstream due to the abovementioned constraints.

According to Maila (2014), the Spatial Planning and Economic Development Department has not been involved in any public participation processes related to the Olifants Letaba Environmental Management Framework; the Kruger 2 Canyons Biosphere Environmental Management Plan or the Limpopo Conservation Plan. There is a clear lack of feedback loops because of work being done in silos. With interconnectedness and integration being a key component of effective Adaptive Management and resilience building, this issue is of particular concern. The issue cannot only be placed at the feet of Maruleng Municipality, with parties such as SANBI, DEA and LEDET also to blame, as they are mandated to ensure the incorporation of their planning tools into the relevant municipal structures (Holness, 2014; Lotter, 2015). These entities should understand that creating tools such as bioregional plans, conservation plans and environmental management frameworks is only the first step of several towards successful implementation of environmental features at local municipality level. Creation of tools should be followed by an awareness raising process to help municipalities understand the information generated and why it is important for their planning processes. This is important because, as identified with Maruleng, there are no employees who understand the environmental and biodiversity planning processes and the benefits incorporating it could bring to the municipality and its people. Also identified in Maruleng municipality was a lack of skills, therefore the entities creating these biodiversity plans need to ensure that they assist with the provision of training regarding the skill sets necessary for the usage of the biodiversity tools. Here basic training on why what spatial layers are important to consider in land use is important, as well as helping to set up land use guidelines for areas ranging from critical for ecosystem service provision to areas of no ecological importance.

The Limpopo Conservation Plan v2 (LEDET, 2013) has a map with several categories rating these levels of biodiversity importance, and are generally referred to as Critical Biodiversity Areas. This was a standardised map for the entire Limpopo, and attached to it is land use guidelines. Because a broader Adaptive Management approach is not followed though the land use categories are set in stone, thus not linking to the ecosystem scenario of each municipality. This is where the ecosystems approach could be of particular importance as it could allow for a better understanding of the socio-economic

status of the municipality and link that to the guidelines. A good example of this is that Maruleng's primary Gross Value Added sector is tourism (specifically the eco-tourism associated with it being an area with a large expanse of protected areas selling the 'African Safari experience'. Even though protection of ecosystems and development are extremely intertwined some forms of trade-offs are often inevitable. Here for an example: most areas in the Critical Biodiversity Areas map for Limpopo encompasses all the protected areas – protected areas being the primary economic supplement in the area means that some trade-offs are thus possibly necessary in order to optimise the ecosystem services these areas provide for tourists whilst, in the process, increasing the human well-being of the people in the area who are economically dependent on the aforementioned tourists. The Critical Biodiversity Area map generally advises against further development in these areas, even though the type of tourism in Maruleng is a sustainable ecosystem service utilisation process as it is dependent on very healthy ecosystems in order to function optimally. When planning is considered in the light of optimising ecosystem service usage in a sustainable way, as in the above example, it will increase the resilience of the ecosystems in the Maruleng area to negative drivers. Over development of the area, due to tourism demands, must, however, be carefully monitored and controlled. Here spatial planning of the protected areas, not only from the municipality's mandate, but also from the management authorities overseeing the protected areas, is important.

A principle not yet applied in biodiversity planning that could come from using an ecosystems perspective is strategic management of areas and the amount of development possible through the utilisation of development limits. This idea is borrowed from South Africa's National Water Act (36 of 1998) (RSA, 1998b). Related to the allocation for water abstraction from rivers and dams, there are water use licenses. The Department of Water and Sanitation calculate the amount of water flow available within a river, thereafter they calculate the ecological reserve and only after that water use licenses for abstraction are handed out (De la Harpe, 2004). If a similar approach could be taken to land it would be ideal, as it takes into perspective the land available and only earmarks land for development if, for instance, the critical biodiversity area, or ecosystem type within which it occurs, is not under threat and over developed. Offsets are also an option here, but as per Rogers (2015), the Deputy EIA Manager of LEDET, in Limpopo, there has only been one successful offset process up to 2014. Effective offsets implementation, or an approach similar to water abstraction, would be a most acceptable systems type approach that would help larger scale management and protection of key ecosystem features. The paradigm between development and the natural environment is an issue, as development tends to be considered more important, but if the ecosystems approach is taken and areas that provide key ecosystem services are prioritised for the least amount of development, similar

to Critical Biodiversity Areas (CBAs – currently only focused on natural inputs to calculate these areas) processes, but more detailed and, with a stronger focus on ecosystem services and how and where they are used, much progress is possible. A systemic larger ecosystems level management approach, such as this, would help create a more intricate understanding of the current state of ecosystems and possible future impacts on them as well as the services they provide. This approach would help to systemically identify key threats to healthy ecosystems and possible reductions in the services they provide, through utilising a bottom up approach that better links anthropogenic drivers to ecosystems and the pressures placed on them.

5.3 UNDERSTANDING THE CONTEXT OF MARULENG AND WHAT THIS MEANS FOR THE ECOSYSTEMS APPROACH

Ecosystems-based planning has an intrinsic anthropogenic focus, utilised within the context of Maruleng, to help align the understanding of ecosystems and their services to the mandate and main purpose of Maruleng Municipality: service delivery, infrastructure development and socio-economic upliftment of its people. The linkages between this mandate to improve the well-being of Maruleng's people, and better planning for ecosystems and their services, is explored below in order to ensure that the value of better planning and management of the ecosystems in the area is realised from a developmental perspective as well.

The western escarpment areas of Maruleng have high population densities, with ward population densities ranging up to 700 people per square kilometres in certain areas. The land cover map in chapter 4 showed that these areas suffer from high levels of urban sprawl, as well as being some of the furthest settlements from the Maruleng Municipality main offices, and thus making service delivery in these vulnerable areas extremely difficult. To add to the vulnerability of the people in this area – their level of education is extremely low (no Matric and less), with Neves and Toit (2013) stating that this factor increases the levels of direct natural resource dependency in the South African landscape. The issue is further aggravated by a lack of economic opportunities and high economic dependency rates with only 14,2% of people formally employed, as stated by the Maruleng IDP (2018). The general Maruleng population also has a 26.8% HIV/AIDS prevalence, with the vast majority of the poor population situated in the western escarpment, most likely meaning that those are areas of concentrated HIV/AIDS prevalence. With a lack of medical services (a clinic for every 9,486 people in Maruleng and only one hospital) one would assume that devastating diseases such as HIV/AIDS also places a massive socio-economical strain on the people. This all creates extremely vulnerable livelihoods that tend to increase the dependencies on direct natural resource usage to supplement a

lack of socio-economic opportunities. For this reason, one can make a very strong case for these Apartheid spatial planning influenced areas to be the main development and service provision priority for Maruleng Municipality.

The fact that the Maruleng Municipality already has a massive service provision backlog, which points to some failures in their and other government sectors' role in the area as developmental promotion entities that should actually help increase the well-being of its people. Adopting an ecosystems approach, one could then strongly argue that, in the case of failed service delivery and poverty, these areas, in all likelihood, are highly direct, natural resource dependent. The ecosystems demand exercise proved this hypothesis to be correct with the data available showing very high levels of direct natural resource dependencies for cooking (76% of the people); heating (64% of the people) and water provision (59% of the people). The dot density maps created in chapter 4 portray the massive extent of the demand and usage of natural resources. The management of these resources, in order to ensure sustainable consumption, is of the utmost importance. Spatial land use planning may not be the best mechanism with which to ensure this happens – as these areas are under municipal jurisdiction – but are also enormously influenced by the traditional authorities residing in the areas. Spatial land use planning should, however, highlight these areas and ensure projects promoting healthy ecosystems are run in the area. Here, for instance, in order to create a holistic approach to improved ecosystems and natural resource management, it would be good to (instead of using legislative governance approaches) use awareness raising within traditional authorities and emphasise the importance of better management of the ecosystems. To increase the likelihood of traditional authorities being keen on such approaches, using the better management as an incentive to increase ecosystem service outputs for the people of the area, could be a feasible mechanism. Uys (2014) and Malepe (2014) mentioned that in this regard the Kruger 2 Canyons Biosphere already plays an important role through their Biodiversity Social Projects programme. This programme focuses on improved natural resource management through more sustainable cattle grazing practices and invasive alien clearing projects. The projects help the communities optimise the ability of the savannah biome to produce grazing land for their cattle whilst also ensuring that the integrity of the ecosystems remains intact – all whilst creating jobs. This type of work should be informed by spatial land use planning that highlights areas of ecological importance to help the projects prioritise those areas for intervention. It could also possibly be linked to spatial land use planning processes through coaxing communities in the area to join such programmes and in the process activating land taxation rebates linked to these improved ecosystems management processes. Such incentives should be incorporated into formalised spatial land use planning processes in the municipality, with the Land Use Management Scheme being an

ideal tool with which to do this, as it could help zone these areas as certain land use types, such as, for example, areas under improved ecological management.

Looking at further indications of natural resource dependencies, Environmental Monitors (2014) from K2C were interviewed and they indicated that people in these areas are also dependant on medicinal plants for traditional healers; wood for fencing and building in the area; wetlands, dams and rivers as water sources for their cattle and goats; rivers for fishing; and riverine sand for building activities. Many of these direct dependencies decrease the health of ecosystems and thus also their abilities to produce these ecosystem services due to unsustainable consumption practices. This is evident through the large chunks of degraded land in the area, as well as the Present Ecological State of rivers in the area tending to be unacceptable. This is not the only pressure on the ecosystems of Maruleng: These areas are of the highest priority to manage sustainable as the most vulnerable people, with the highest direct natural resource dependencies, reside there. The areas also have some threatened terrestrial ecosystems making them both socio-economically and ecologically vulnerable. Legogote Sour Bushveld and Tzaneen Bushveld are located along the western mountain areas where cattle grazing takes place and which is considered to be vulnerable according to the threatened terrestrial ecosystems database for South Africa. Moreover, Lowveld Riverine forests (also vulnerable) are located around the Blyde river further east and are being placed under severe pressure as developments such as the Blyde Wildlife Estate has been established in the exact same spot where the largest section of this forest is found. This is a good example of ecosystems under increasing threat due to the demand for cultural ecosystems services provided by wildlife estates such as a bush retreat, but which also attracts massive foreign investments. Here the paradigm between development and ecosystems preservation clashes, with development prevailing, most likely due to a lack of understanding of exactly what ecosystems-benefits these forests bring.

5.4 WILL IMPROVED SPATIAL LAND USE PLANNING WITH A FOCUS ON ECOSYSTEMS PROMOTE RESILIENCE IN THE CONTEXT OF MARULENG?

Resilience has become a catch phrase that gets thrown around without proper context or understanding (Simonsen *et al.*, 2014). It can be applied to a multitude of elements. In this context, for example, one could wish to improve the rigidness of spatial land use planning structures to corruption, bad institutional arrangements, or from the SES perspective, attempt to improve the resilience of ecosystems to specifically climate change or flood events, etc. For this reason, the question is asked, what exactly needs to be made more resilient, and to what? The approaches set out in chapter 2 give a good indication of what the aims are when mentioning resilience. The SES

approach and ES approach is anthropogenic in nature, with complexity stating that one cannot detach the natural environment from the anthropogenic context. The two are intrinsically and explicitly intertwined (Schneider and Bauer, 2007), with the natural environment influenced by human factors as well as humans and their development being influenced by what the natural environment can provide (in the form of ecosystems and their services). The aim is thus to improve the resilience of ecosystems to human development that causes degradation, in order to help ensure sustainable and optimal ecosystem services utilisation can be achieved.

The fact that ecosystems are interlinked with the anthropogenic insinuates that if one wishes to help make ecosystems more resilient, one will have to do so for the humans to be reliant on them as well. An example in this regard is that if one is to promote more diversified livelihood dependencies, it will help reduce the pressure on natural resources. In the Maruleng context the western escarpment area, where the majority of the population lives in relative poverty, it means that their dependencies on ecosystem services such as water provision, fuel for cooking and heat is relatively high. This is because of a lack of economic opportunities emanating from a lack of infrastructure, education and other factors. Identifying these issues in such a systemic way is important as it allows for the realisation that when spatially planning development for the areas in close proximity to the escarpment much emphasis needs to be placed on ensuring sustainable ecosystem services usage. An ecosystems focused spatial land use planning tool should be seen as a contextualisation tool/framework that would help guide Maruleng towards achieving better resilience through adopting a more Socio-Ecological System focused approach.

Increasing the resilience of ecosystems to negative drivers in order to ensure continued beneficiation from its services should be considered as fundamental to the way municipalities plan (Lotter, 2014). The reality is that ecosystems provide benefits free of charge, helping municipalities fulfil key functions of service provision that would have cost them vast sums of money to provide otherwise. The water supply; the wood for firewood and cooking; the grazing for cattle around the western escarpment; the naturally occurring wildlife feeding the tourism industry on the east, and how this pushes up the value of the land in the area allowing for more money to flow in; the sand for building in the rural areas; the reeds helping with flood attenuation, (meaning no engineering structures are needed); the fish from rivers supplementing the diets of the vulnerable in the Olifants and Blyde; the fertile soil providing for feasible agricultural practices around the Blyde, contributing to food security; the carbon sequestration from the savannah (as unpacked in Chapter 4 under the Ecosystem Service Provision and Demand sections). These ecosystem services and many others are the building blocks of the state

of human well-being in Maruleng. In order to ensure it gets used sustainably and to promote its resilience, it has to be planned and managed properly.

The first phase of effective planning is to have a good understanding of the system of interlinkages between the health of ecosystems and human well-being and where these systems occur. Thereafter how to pro-actively manage the ecosystems in order to ensure that it gets utilised in an ecologically sustainable way, needs to be planned. The final step is the implementation of the management planning, as informed by the understanding created of the system, in order to ensure that the ecosystems are more resilient to negative drivers. The reality is that step three can take place without step one and two. An example is the K2C and their Biodiversity Social Projects working on promoting the health of ecosystems on the ground without having the two formalised planning steps that come before the implementation. They did follow a similar approach, but in a less formalised way, and in a silo. If a municipality such as Maruleng could have an overarching priorities area framework as informed by step one and two, more coordinated and collective action could lead to far better results. This is where an ecosystems-focussed spatial land use planning approach could be ideal, as it could help identify all the projects in progress in the area and spatially align their working areas for maximum beneficiation to ecosystem health and consequently human well-being. The perfect tool with which to capture this informative role of spatial land use planning should be the SDF and IDP at local municipal level. To further increase the resilience of the ecosystems of Maruleng, the LUMS should also be utilised. It would be the ideal pro-active planning tool to ensure that when going forward land use scenarios, that negatively impact ecosystems, is minimised. The LUMS is the tool used to do the zonation of a municipality. If zones that fall within certain ecosystem types (such as threatened terrestrial ecosystems or key water resource areas for instance), the LUMS could zone these as areas earmarked for developments or land uses that are not a threat to the health of the ecosystems.

Undertaking the planning processes discussed in the previous paragraph will be an extensive task, one that would be virtually impossible for Maruleng without collaboration with its people and relevant other authorities. The level of environmental planning that would be needed for the ecosystems approach, would also not be the mandate of local municipalities, but that of environmental authorities such as DEA, LEDET and some parastatals such as SANBI. The municipality would be the entity responsible for including it into their development planning processes. The ecosystems approach should not try and reinvent the wheel but rather align itself with already existing plans in order to reduce the burden it would place on the entities responsible for carrying it further. In light of this, a good approach would be to use existing tools such as bioregional plans or environmental management

frameworks. These tools could be modified to incorporate a stronger ecosystems approach. These tools are used in order to inform municipal planning, but according to Holness (2014) it has been difficult up to this point to do so. Adding an ecosystems approach would most likely promote the level of bioregional-plan incorporation because it creates an explicit link between the improvement of human well-being (municipality's mandate) and better management of the environment (bioregional plan's mandate). Currently bioregional plans do not speak to the municipality's development mandate, which makes it less relevant to them, even though it is legislated under SPLUMA (RSA, 2013) to be incorporated. The ecosystems approach creates that direct link between the environment and development and thus should assist the development planners to better understand the importance of the environment and how that feeds into their planning processes.



Figure 5.2: Key Leverage Points that can be targeted when an ecosystems approach to spatial planning is taken (Researcher, 2019)

5.5 CONCLUSION

Taking an ecosystems approach using the framework set out in chapter 2 does have several constraints and applying it, using Adaptive Management, will have several stumbling blocks as well, especially

within the constraints currently facing Maruleng Municipality. It would, however, also have several benefits as highlighted in this chapter. An approach such as this would take a lot of work, but if the silos are broken down between the relevant partners and a bottom up approach is taken that also devolves some responsibilities to the land owners for implementing the principles of the ecosystems approach, success is likely. The direct link an ecosystems-approach makes between ecological and development spheres would likely help create the links between the relevant institutions and help promote the idea of tackling the systemic issues that persist in environmental planning. Implementing the ecosystems-planning process is seen as not being a low hanging fruit, but one that can and should be championed if the resilience of ecosystems and the services they provide is to be improved.

CHAPTER 6: RECOMMENDATIONS AND CONCLUDING REMARKS

6.1 INTRODUCTION

The overarching research question asked whether opting for an ecosystems approach to spatial land use planning in Maruleng Municipality would increase the resilience of its ecosystems, its services, and interlinked human well-being. The second part of the research question asked what the considerations would be if the option decided upon was the type of approach described in the first part of the question. Below a breakdown is provided of the key findings for each chapter, and how that was of help in answering the Research Question.

6.2 KEY FINDINGS

Looking at what could constitute the theoretical framework of an ecosystems angle to spatial land use planning, helped highlight the importance of taking a complex adaptive systems approach, within the Post Modernistic setting of current governance systems of ecosystems planning and management at grassroots level. It also highlighted the importance of adopting an Adaptive Management approach in order to deal with the complex socio-ecological system that ecosystems based spatial land use planning attempts to better understand and manage.

The governance and institutional arrangements around current environmental and development planning is explored in the next chapter in order to create a better understanding of how an ecosystems approach to spatial land use planning could be implemented, and to explore the feasibility thereof. The key finding was that currently **environmental and development planning is taking place in silos**, from legislative level down to local implementation level. SPLUMA (RSA, 2013) does attempt to bridge the divide, but leaves much space for improvement regarding the more recent tools such as NEMBA, Bioregional Plans and NEMA Environmental Management Frameworks try to cross the divide (RSA, 2004a; Driver, *et al.*, 2012; DEA, 2009; RSA, 1998a). From the development planning sphere, the introduction of SPLUMA and local municipal planning tools such as the SDF and LUMS also provides good, albeit untapped, opportunities (Ruwanza and Schackleton, 2015). In the Maruleng area some of these tools have had very limited success, with local government development and spatial land use planning showing **limited incorporation and understanding** of the important roles ecosystems and their services play in promoting human well-being. There are several challenges that have to be considered, including a combination of complexities of the proposed ecosystems approach; **limited local municipality resources and capacity and political complexities** driven by the need for

developmental prioritisation and service delivery, as well as the lack of maturity in the implementation process of SPLUMA (RSA, 2013).

In order to create a more systemic understanding of the area, the contextual analysis (VSTEEP) produced a spatially explicit picture of where key ecosystem supply areas occur and where the areas of high ecosystem consumption and development occur. Land use planning could highlight these areas for formal zonation as environmentally sensitive zones similar to what is done for Critical Biodiversity Areas under NEMBA (RSA, 2004a). Moreover, the environmental sector can also contribute through looking into **pro-active land use securing (and thus linked ecosystem service securing) tools** such as protected areas under NEMPAA (RSA, 2003). More **reactive and case specific land use management tools** could also be taken by, for instance, using programmes such as those from Expanded Public Works, focusing on alien invasive plant clearing; wetlands rehabilitation and land rehabilitation (Uys, 2014). From the angle of the demand for ecosystems in the Maruleng footprint there are two highly disparate matters. The eastern areas of Maruleng place a large demand on cultural ecosystems services, with the wildlife tourism industry, which is also the primary economic driver of Maruleng, being heavily dependent on natural landscapes and healthy ecosystems. These demands need to be considered when development planning occurs. The tourism sector strongly drives the Maruleng area's economy and not managing it from a risk and opportunity perspective could severely affect the livelihoods of the people. Similarly, if the areas delivering key ecosystem service provisioning areas **directly supporting the livelihoods** of the most populous areas in the west of the municipality are not managed, these people's livelihoods would be severely affected.

It is found that a systemic approach to conserve these key areas is paramount, and municipal spatial land use planning has a fundamental role to play. The correct governance framework would be needed to make this possible. Maruleng already has capacity limitations; political pressure and extensive service delivery backlogs. Taking an ecosystems approach that will potentially only yield tangible results going well past current political cycles and within the current rigid governance systems positive effects will be hard to monitor and evaluate. Taking an ecosystems approach will need a partner and land owner/user-based approach where the municipality acts as enabler in order to help navigate all the complexities and potential blockages.

6.3 RECOMMENDATIONS

The recommendations will highlight the key aspects of taking an ecosystems approach in spatial land use planning and then provide recommendations on how to take this approach to an implementation

level whilst considering the enabling and disabling factors as they emerged within the Maruleng context:

- **SPLUMA (RSA, 2013) and its tools (SDF and LUMS):** With the inception of SPLUMA in 2013 municipalities were given five years to align their Spatial Development Frameworks and Land Use Management Schemes. This is a key window of opportunity to ensure from a legislative perspective that an ecosystems approach is implemented as the legislation states that these planning tools need to comply to environmental legislation (Section 19 for the SDF and Section 24 for LUMS); as well as demanding under Section 7 – Development Principles that *“under the principal of spatial sustainability, spatial planning and land use systems must incorporate the principal of efficiency whereby decision-making procedures are designed to minimise social, economic or environmental impacts”* (SPLUMA Chapter 2, Section 7 (b) (iii)). With SPLUMA creating a legislative environment in favour of integrating development and the environment, having an ecosystem focus in spatial land use planning would be ideal (RSA, 2013). With the legislation stating that the environmental information needs to be incorporated from current environmental plans, an issue emerges, as these current plans do not have a strong ecosystems approach within the Maruleng context. The Mopani Bioregional Plan would be ideal to help take an ecosystems approach, although it is a few years away from needing to be reviewed, and whether it does have a stronger ecosystems focus to help municipalities realise the value of healthy ecosystems for its people, is unknown and doubtful, as the legislated norms and standards for bioregional plans do not drive home a focus on them (DEA, 2009). This window of opportunity thus seems to be subdued due to the lack of an ecosystems approach emanating from the environmental and biodiversity planning tools at the disposal of Maruleng in order to inform the alignment of their SDF and LUMS with SPLUMA by 2020 (extended after initial 5 years given by CoGHTA to municipalities for alignment). Bioregional Plans need to be reviewed every five years so after its inception late in 2016 and gazetting in 2018, it will in all likelihood only be reviewed again in 2021, whilst the Maruleng SDF and LUMS will similarly only be reviewed around those dates. This bureaucratic blockage can be circumnavigated if an intent is shown by LEDET and Maruleng Municipality, but with both facing resource constraints and rigid performance targets not associated with taking an ecosystems approach, it is unfortunately not likely to happen. Whilst ecosystem approaches remain limited through Bioregional plans; SDFs and LUMS in the landscape, protected area expansion continues to take place. Although ecosystems focussed approaches are not always central to new protected areas being declared, it does secure ecosystem functionality.

- **Adaptive Management:** As mentioned in the previous point, applying Adaptive Management would be very difficult in the current rigid and bureaucratic governance systems which are in place at local government level. With the decentralisation of the powers of spatial land use planning to municipalities under SPLUMA (RSA, 2013), and municipalities being enabled through the IDP, the ability to create their own vision and mission statements, as well as the projects to realise this, it is a key opportunity for ecosystem-based planning approaches to be emergent within the local government sphere. For Maruleng it would be difficult though, as it is dependent on external funds to improve the well-being of its people. The external funds often come in for very specific projects and have links to that specific set of targets, thus it would be difficult to take an adaptive approach that considers planning that incorporates and understands a broader set of systems. Moreover, taking an ecosystems angle in spatial land use planning could be seen as cumbersome and resource intensive, something that would place even more stress on already limited human capital within the municipality.
- **Valuation of ecosystem services:** Valuing ecosystem services, in the context of this study, was never about adding a monetary amount to the services provided, with only the carbon sequestration of savannah used as an example in chapter 4. The idea was primarily to raise awareness of the support it provides to the well-being of the people of Maruleng. Valuing it is a complex and often subjective task, and thus ecosystem services were simply highlighted in the research mentioned in chapter 4. Valuation, however, could be considered as a next step in the ecosystems approach to land use spatial planning, and could play an important role in helping the spatial planners of the municipality place a price or trade off to development on certain key ecosystem service producing land parcels.
- **Managing in a Complex System:** Figure 6.1 shows the key drivers from a spatial land use planning perspective influencing the Maruleng Municipality decisionmaking processes. This emphasises the complexity spatial land use planning is enveloped in. It has to consider a multitude of factors and therefore cannot be done in a linear way. Dealing with such complexity does mean that some simplicity needs to be implemented in order to create a better understanding of the system. A tangible example of this can be seen below where key drivers are broken down into how much influence the municipality would have over it through its spatial land use planning process. The level of focus needing to be placed on addressing certain drivers will be determined through various prioritisation processes, but in a complex system one of the key places to start is to list the drivers and the levels of influence the municipality has over it. Being a complex system, where each driver falls in terms of priority, will, however, be in constant flux and need to regularly be reviewed and adaptively planned and managed for.

One of the underlying factors influencing the positivity or negativity that many of the key drivers below brings, is, however, the ability of ecosystems of Maruleng to provide ecosystem services, making it a priority to attempt to plan for and manage in a manner that would promote its resilience to negative drivers.

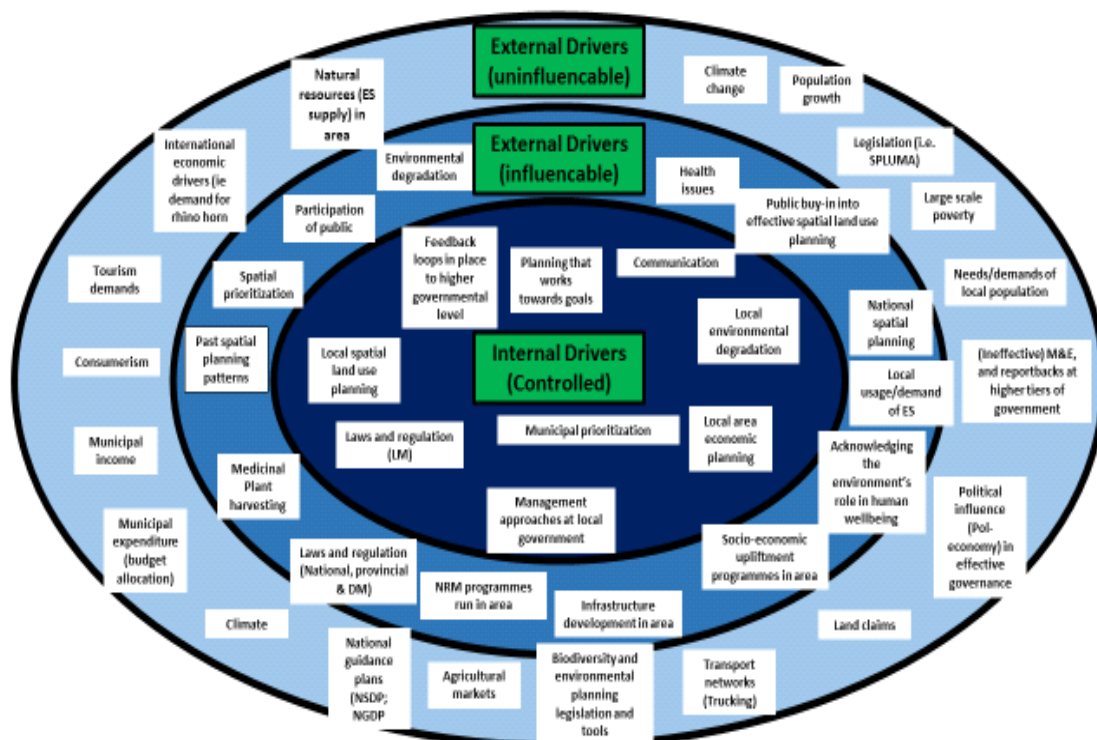


Figure 6.1: Drivers of change in Maruleng Municipality (Researcher, 2019)

- Taking a bottom up approach:** Involving land owners from the start when using an ecosystems-approach in spatial land use planning will be most important. The idea behind the development of zones of ecosystem function importance, or similarly the Critical Biodiversity Areas spatial layers used by the Limpopo Conservation Plan, is to enforce allocation of land for development in less ecologically sensitive areas. This is a wonderful concept, but planning these zonations should not be seen as the achievement worked towards, but rather as the stepping stone towards eventually being able to sustainably manage existing land parcels in a way that promotes healthy ecosystems as well. Achieving this is not the primary role of the municipality, or relevant environmental departments, but that of land owners and land custodians. Using an ecosystems-approach should thus from the start ensure the buy-in from land owners. In Maruleng the largest land owners are the four traditional authorities and communities, the protected area network (formally declared and informal areas) and the commercial agricultural enterprises. It is important when taking the ecosystems-approach to do so collaboratively with these and other key land owners or custodians. Collaboration should be done in a way that

helps them understand why it would be to their benefit to manage the important ecological areas, as highlighted by the spatial land use planning processes.

- **A layered approach:** South Africa has good legislation pertaining to the protection of ecosystems. When looking at legislation that could help secure land use that benefits the production of ecosystem services, the following pieces of legislation can be used to secure key areas:
 - Through NEMBA agreements can be signed with land owners securing the land use for biodiversity purposes. Bioregional plans can also secure key ecological areas through Critical Biodiversity Area maps.
 - Through NEMA Environmental Management Frameworks could assist to better inform Environmental Authorisations and development planning (DEA, 2010).
 - Through NEMPA various forms of Protected Areas could be declared, securing land for conservation purposes that often also secures ecosystem functioning.

These are all various different land use designation mechanisms which should be used harmoniously to help secure areas of ecosystem service delivery importance. The biggest challenge, however, remains. The abovementioned mechanisms can all help secure land use that promote ecosystem production. All of these, however, will have limited effect on their own and need to be incorporated into local municipal development planning, because as can be seen in figure 6.2 below all development planning needs to spatially come together under local municipalities as per SPLUMA (RSA, 2013) and the Constitution (RSA, 1996).

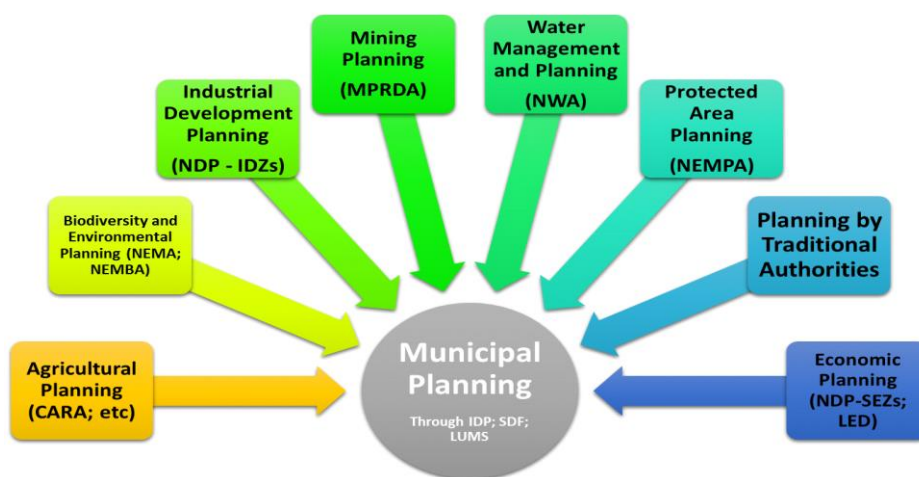


Figure 6.2: Development and Environmental Planning Considerations at Local and District Municipality level (Researcher, 2019)

- **Breaking down silo approaches:** Currently there is a slow breakdown of the barriers between developmental and environmental planning processes within government. Understanding ecosystem services will help break down the silos as it creates the direct link between improved

management of the environment and the benefits it provides people, reducing the burden placed on the government to provide key services. Before the divide between development and environmental can be completely broken down, it is important to understand that currently environmental planning is the mandate of national and provincial authorities (currently in the Maruleng area it is DEA, LEDET and SANBI and SANParks); whilst development planning is the mandate of national, provincial and local authorities such as Maruleng Local Municipality. The breaking down of silos in order to achieve an ecosystems-approach to spatial land use planning will require a mandate-sharing process to be implemented whereby local authorities are given a more prominent role. This needs to be forthcoming with proper resource allocation to Maruleng (Maila, 2014) as they are already under much pressure to fulfil their functions.

- **Streamlining land use planning and management processes:** The institutional analysis done in chapter 3 revealed that from a land use and environmental perspective eight pieces of legislation; 13 strategic plans and tools as well as a multitude of primary role players. On top of this, chapter 4, through the VSTEPP approach, identified the complex environment within which Maruleng currently operates. If an ecosystems approach was to be taken towards land use planning, all of the variables of the complex environment, as well as the governance frameworks developed through legislation and strategic plans and tools will have to be managed very carefully. Adaptive Management will be critical to apply constantly in order to adjust and manage the complexities of the changing environment. Whilst Biggs *et al.*, (2015) states that diversity and redundancy promotes resilience, one has to consider its potential impacts on efficiency. With, according to Maila (2014); Manoko (2015); Anonymous (2015) and Lotter (2015), capacity constraints and bureaucratic systems already placing a large burden on individuals responsible for land use and environmental planning processes, streamlining and harmonisation of legislation and plans will be critical to an ecosystems-based approach to land use planning.

6.4 CONCLUDING REMARKS

The concept of having an ecosystem focus within spatial land use planning at local municipality level has been explored extensively in this study. The framework for doing this has not been developed, and this study did not aim to do so either, but chapter 2 was used to explore the possible theoretical departure points for compiling such a framework. It was conceived that for effectively marrying environmental and development planning, using complex adaptive systems as the school of thought need to be followed. It would allow for the promotion of environmental planning that could, more than the current tools at the disposal of municipalities, embrace the complex and interested environmental and developmental spheres (Nelson and Bennet, 2005 and Holmes-Watts and Watts, 2008). Although weak at the moment, linking environmental planning to development is paramount

to making ecosystems more resilient to negative drivers as it is a mechanism for increasing the value of the environment to local government planners and managers within the South African developmental state context. The ecosystems angle was envisaged as a possible ingress through which to bridge that gap, as it makes more explicit the benefits humans are provided free of charge through ecosystem services.

Adaptive Management was seen as the best tool for managing such a complex framework. It was found that there was a real lack of an Adaptive Management approach currently within the governance and legislative frameworks existing for Maruleng, running from the municipality and its planning systems (such as the IDP, SDF and LUMS) up to national level legislation, related to environmental planning and spatial land use planning. The planning systems currently in place were found to work in silos, with development mentioned in the environmental tools, but no explicit links made on how the two interlink. The same situation was evident in the spatial land use planning governance systems. Taking an ecosystems-approach in spatial land use planning (as described in the theoretical framework chapter) was then applied to the current environmental and spatial land use planning systems to explore how creating interlinking in the governance and planning spheres could create tangible outcomes at local municipal level.

The exploration of applying the ecosystems-approach was used within the context of Maruleng, with discussions identifying a clear need for improved environmental planning at local municipality level. Using the ecosystems-approach evidently will have major benefits, and will go a long way with regards to integrating the two planning processes that up to this point has been done largely in silos. The reality is though that not even the linear planning processes currently being followed are implemented effectively within Maruleng due to massive resource deficits, as well as a huge backlog in service delivery (Maruleng Municipality, 2014f, 2014g). Moving to a systemic planning process, such as an ecosystems-approach, will require more resources and often improves the well-being of the municipality's people through providing tangible but hard to quantify benefits. Within the bureaucratic top down systems in place in government in South Africa, adopting an ecosystems-approach will be hard to justify. Doing so, however, does not need to be a once off process and could be phased into the planning processes of the municipality. Important to implementing such an approach will also be creating buy-in from land owners and custodians, such as the traditional authorities in Maruleng, as the spatial land use planning tools will only lead to more resilient ecosystems if the areas planned for as key to preserve in order to provide key ecosystem services are also placed under improved management measures, which will be the role of the land owners and

custodians. Finally, the success of an ecosystems-approach will be dependent on its ability to not re-invent the wheel, but to attach onto existing environmental planning tools such as the Limpopo Conservation Plan and the Mopani Bioregional Plan, as suggested by current biodiversity planners, Lotter (2014) and Holness (2014).

In conclusion, implementing a framework as complex as ecosystems-focused land use and spatial planning, is not a simple task. To be done holistically, it would have to firstly change the way current biodiversity and environmental planning is conceptualised and done by the environmental authorities, as well as the municipalities. To implement such an approach would also imply that some form of management changes is needed, related to how planning, implementation, monitoring and evaluation are done. Most important for the success of such an approach is also the notion that a mindset change needs to take place within the governance structures of municipalities. Adopting a bottom up approach, whereby awareness is raised about the importance of ecosystems and their services to the people living in the municipality, will be key. This is a daunting task, one that would possibly take quite some time to successfully implement in already overburdened government departments.

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APPENDIX 1: INTERVIEWS AND QUESTIONNAIRES

SECTION 1: QUESTIONNAIRE

EXPLORING THE POSSIBILITY OF TAKING AN ECOSYSTEMS APPROACH TO SPATIAL PLANNING AT LOCAL GOVERNMENT LEVEL

Name and surname: _____

Institution: _____

Position: _____

Date: _____


1. What, in your opinion, is the role of the municipality with regards to land use and spatial planning?


2. What criteria/imperatives do you think should inform spatial planning and prioritization?


3. Are you familiar with ecosystem services* & using it in spatial planning? Please name examples


Ecosystem services definition: "It is the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth" (Millenium Ecosystem Assessment 2005)

RATE LEVEL IMPROTANCE OF ES (Circle): 1 2 3 4 5 6

 **Wehncke van der Merwe**
 Brief explanation: What do you perceive as what they need to do to insure to insure effective and integrated land use planning and zonaton

 **Wehncke van der Merwe**
 Meaning what large drivers/overarching aims etc do you think should inform the spatial planning prioritization in general

 **Wehncke van der Merwe**
 This is looking at the trend of environmental planning and whether integration which is more holistic, with special reference to environmental mapping, is present not only with your traditional conservation agencies, but that the importance of ecosystem services is also acknowledged in other spheres of planning

 **Wehncke van der Merwe**
 This rating will look at the perceived importance of ecosystem services to integrative spatial planning

EXPLORING THE POSSIBILITY OF TAKING AN ECOSYSTEMS APPROACH TO SPATIAL PLANNING AT LOCAL GOVERNMENT LEVEL

4. How familiar are you with Integrated Development Programme and Spatial Development Framework processes? And what do you think the function of the SDF is and should be within municipal planning?

RATE LEVEL OF FAMILIARITY (Circle): 1 2 3 4 5 6

5. What do you consider to be important ecosystem services in Maruleng? Also please find a map of Maruleng attached at the end of the questionnaire where you can spatially indicate supplies/provision of ecosystem services on the first map and demand/utilisation on the second map



Wehncke van der Merwe

This first part of the question is looking at the awareness of people with regards to municipal planning processes and the influence it has on development patterns. The rating question relates to this part of the question



Wehncke van der Merwe

Looking at the public as being able to be a large driver in municipal planning through public participation processes, this question is asked as a way of understanding their perceptions, especially around their perspective on what they observe it to be vs what they would like it to be



Wehncke van der Merwe

Based on your knowledge of Maruleng where do you think there is key areas with regards to high ecosystem services provision/supply and utilization/demand. (The participatory mapping approach taken is to really get to grips with where there are a supply and demand for ecosystem services and how important they are for the people on ground level. It is therefore a question based on utilizing the knowledge of the people on ground level, but your inputs as professional involved in the area in some way or another (be it planning, implementation or research) is also very important. Please find two maps attached at the end of the questionnaire on which the important ecosystem services provided the area by the natural environment (Map 01) and where utilization of these services by people happens (Map 02), can be drawn in as part of the participatory mapping approach- thank you

EXPLORING THE POSSIBILITY OF TAKING AN ECOSYSTEMS APPROACH TO SPATIAL PLANNING AT LOCAL GOVERNMENT LEVEL

6. Do you think the ecosystem services around Maruleng are adequately addressed in the municipality's IDP and SDF? (If it is not, why do you think that is the case?)

RATE HOW WELL ADDRESSED (Circle): 1 2 3 4 5 6

7. What, in your opinion are the major concerns around ecosystem services in the Maruleng area

RATE LEVEL OF CONCERN (Circle): 1 2 3 4 5 6

8. Do you know of any interventions taking place from government's side in response to these issues?

RATE INTERVENTION LEVEL (Circle): 1 2 3 4 5 6



Wehncke van der Merwe

This question is based on opinion, if extensive knowledge is not possessed the question can still be answered, just state why you think it might be/might not be adequately addressed
 The rating can be what your perception is, not necessarily needing to be accurate



Wehncke van der Merwe

This can be any form of threat to provision of the services mentioned in question 05



Wehncke van der Merwe

High level of concern would mean you are very worried about the management/usage/degradation of these ecosystem services, and vice versa for rating it lower. Please specify the concerns and why



Wehncke van der Merwe

Looking at the interventions known to be taken to prevent the concerning issues present. This is bound by government, meaning not only the municipality but other governmental spheres as well (e.g. implementing of NEMA regulations around EIAs or DEA doing a Working for Water programme in the area). If any known interventions by civil society through for instance NGOs or other initiatives come to mind, please feel free to name them as well

EXPLORING THE POSSIBILITY OF TAKING AN ECOSYSTEMS APPROACH TO SPATIAL PLANNING AT LOCAL GOVERNMENT LEVEL

9. In your opinion is there a trend towards the increased acknowledgement of the importance of ecosystem services in a municipal context? Examples please

RATE TREND (0 = No Increase 6 = Big Increase) 1 2 3 4 5 6

Possible meetings or forums you are aware of that might be of interest to this case study

If you have any ideas or suggestions on how to make ecosystem services more explicit in spatial and other development tools/plans at local municipal level please feel free to provide inputs. Thank you



Wehncke van der Merwe

Do you think more awareness of ecosystem services and the benefits it brings is created at municipal level at **Mgungu** municipality and also in general? (The awareness of ecosystem services does not imply that it is explicitly stated. A general awareness that protecting the environment can benefit people can for instance also be seen as a sign of increased acknowledgement of the importance of ES



Wehncke van der Merwe

This is just a side question to help me keep track of what is happening on ground level to help identify areas where further engagement (to create a better understanding of the area) might be relevant



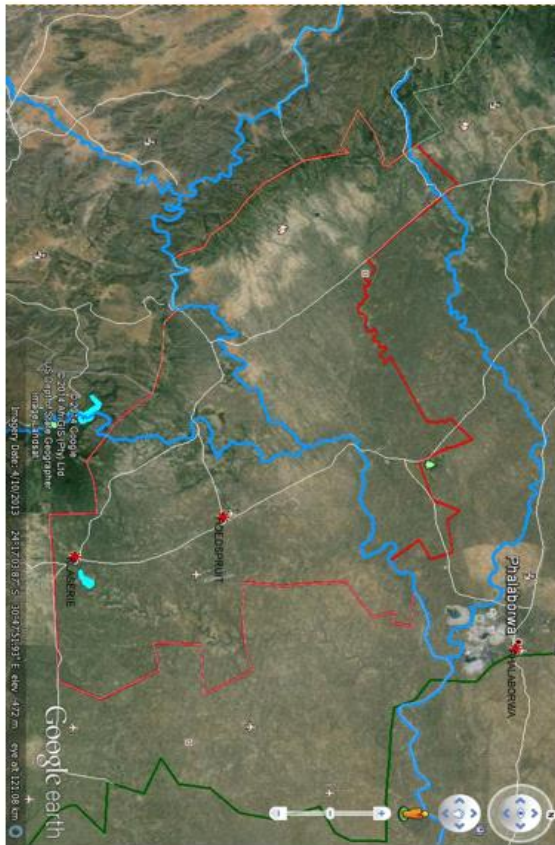
Wehncke van der Merwe

The reason for the focus on ecosystem services is that it incentivises better management and protection of the environment/ecosystems because it makes the value of it much more explicit. There will not be attempted to attach a monetary value to the ecosystems around **Mgungu** because of the pricing methods being limited to my knowledge, but creating awareness of the value of ecosystem services is seen as the main objectives, so any inputs around how to do that and be able to hook the municipality into buying into that would be appreciated. Thanks

EXPLORING THE POSSIBILITY OF TAKING AN ECOSYSTEMS APPROACH
TO SPATIAL PLANNING AT LOCAL GOVERNMENT LEVEL

Annexure: Maps of Maruleng for participatory mapping process as
explained in Question 05

Map 01: Contextualisation Map

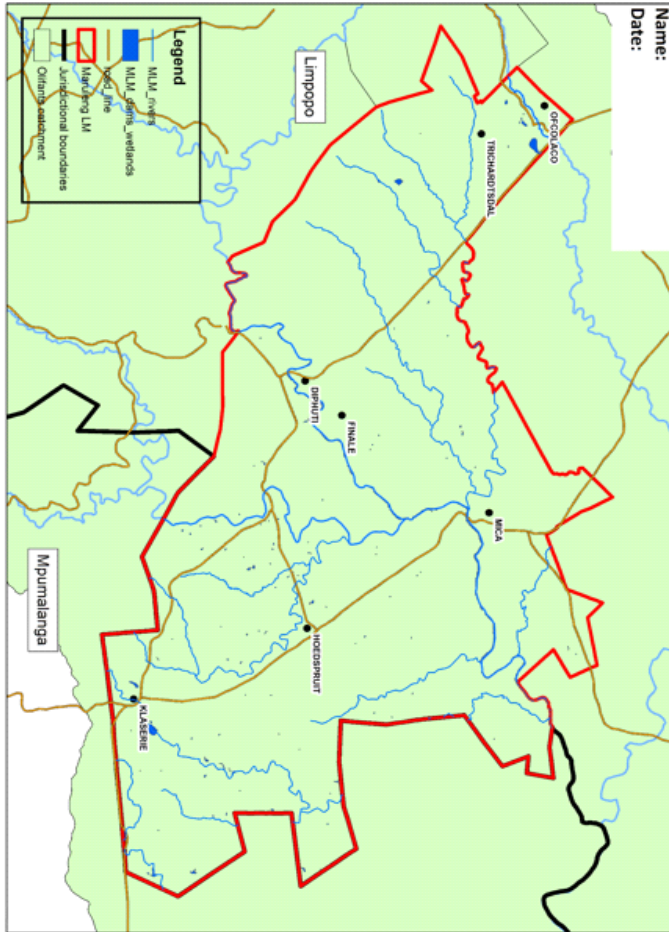


Wehncke van der Merwe

Please note this is simply a google earth view of the area to provide a better understanding of the physical features of the area. On the next two pages is the maps on which you can draw where you think ecosystem service supply and demand occur

EXPLORING THE POSSIBILITY OF TAKING AN ECOSYSTEMS APPROACH
TO SPATIAL PLANNING AT LOCAL GOVERNMENT LEVEL

**Map 02: Exploratory Collaborative Mapping of
Provision/Supply of ES by natural environment (Question 5)**



Wehncke van der Merwe

Map on which supply of ecosystem services by the natural environment/Ecosystems can be mapped/drawn in, as related to question 05

SECTION 2: QUANTITATIVE QUESTIONNAIRE RESULTS

	Undisclosed	Promise Maila	Stephen Holness	Mervyn Lotter	EM - Beauty	EM - Boledif	EM - Getrude	EM - Madibe	EM - Masete	EM - Matrice	EM - Santegs	EM - Sedana	EM - Wilma	Johan Kruger	Christine Du Preez	Andreas Manoko	Karen Steenkamp	Melinda Rogers	Mina Malepe	Average	
Are you familiar with ecosystem services & using it in spatial planning? Please name examples - RATE LEVEL IMPORTANCE OF ES		2	2	6	5	1	1	1	1	1	1	1	1	1	6	1	6	6	4	2	3.1
How familiar are you with Integrated Development Programme and Spatial Development Framework processes? - RATE LEVEL OF FAMILIARITY		6	6	5.5	4	1	1	1	1	1	1	1	1	1	3	6	6	4	3	2	3.4
Do you think the ecosystem services around Maruleng are adequately addressed in the municipality's IDP and SDF? - RATE HOW WELL ADDRESSED		3	5	1	1	3	3	3	3	3	3	3	3	3	1	2	3	1	2	3	3.1
What, in your opinion are the major concerns around ecosystem services in the Maruleng area - RATE LEVEL OF CONCERN		6	5	6	6	5	5	5	5	5	5	5	5	5	6	6	4	6	6	6	6.4
Do you know of any interventions taking place from government's side in response to these issues? - RATE INTERVENTION LEVEL		5	5	3	2	4	4	4	4	4	4	4	4	4	3	2	3	4	3	3	4.3
In your opinion is there a trend towards the increased acknowledgement of the importance of ecosystem services in a municipal context? - RATE TREND (1 = No Increase 6 = Big Increase)		1	6	4	2	3	3	3	3	3	3	3	3	3	2	4	3	2	4	2	3.6