MOVING FROM INTEGRATED WATER TO INTEGRATED NATURAL RESOURCES MANAGEMENT (INRM):

A Proposed Framework for INRM at the District Scale in South Africa

D Cox, S Oosthuizen & C Dickens

WATER RESEARCH COMMISSION

TT 643/15

MOVING FROM INTEGRATED WATER RESOURCES MANAGEMENT (IWRM) TO INTEGRATED NATURAL RESOURCES MANAGEMENT (INRM)

Report to the
Water Research Commission

Prepared by

D Cox, S Oosthuizen & C Dickens
Institute of Natural Resources

WRC Report No. TT 643/15

NOVEMBER 2015

OBTAINABLE FROM
Water Research Commission
Private Bag X03
Gezina, 0031

orders@wrcorg.za or download from www.wrc.org.za

The publication of this report emanates from a project entitled *Moving from Integrated Water Resources Management (IWRM) to Integrated Natural Resources Management (INRM). A Proposed Framework for INRM at the District Scale in South Africa.* (WRC Project: K8/1035)

ISBN 978-1-4312-0696-4

Printed in the Republic of Asouth Africa

EXECUTIVE SUMMARY

Our natural resources are under increasing pressure to support the country's economic growth agenda. Despite a comprehensive legal framework designed to ensure the sustainable utilisation of these resources in achieving the desired levels of growth, environmental reporting at all levels indicates that we are not giving effect to the intention of this legislation. The management of natural resources is inherently complex and requires an approach that accounts for integration across different resources, scales of management, time and a broad diversity of users and resource managers at these various scales.

The concept of Integrated Water Resources Management developed as an approach to assist in dealing with this complexity. A limitation of IWRM lies in the fact, that despite the explicit requirement to involve all stakeholders and resources, it has a water centred focus. Integrated Natural Resources Management (INRM) has developed from IWRM and aims to provide a more holistic approach.

This project builds on the outcomes of the Afromaison project that presents an approach centred around five key elements considered necessary to facilitate improved integration in Natural Resource Management. The project focussed on developing practical tools and guidance to integrate these elements in NRM practice. The elements are:

i. An ecosystem services foundation.
ii. Integration at the Meso-scale (district municipal level).
iii. An appropriate institutional structure.
iv. Tools and instruments to ensure a long-term management view.
v. Effective stakeholder engagement.

The report documents the main barriers to integration as identified through the experience in the Uthukela District Municipality, located in KwaZulu-Natal which served as the South African Case study for the Afromaison project. The project then proceeds to describe the benefits of the 5 elements individually in terms of improving integration and how they would apply in the case study context. The report concludes by presenting the INRM framework as a whole and describing the collective value of the various elements. While not all the elements or concepts are new, the project has added to existing thinking and provided tools for making the framework useful.

Throughout the report analysis is made with regards to the state of water resource management and motivation is provided as to how the proposed framework could overcome some of the challenges currently faced by the water sector. One new element in particular – the proposed institutional structure is considered to provide numerous benefits given the state of institutional change with regards water resource institutions.

In summary a somewhat new, practical framework and supporting tools are proposed to assist in dealing with the inherent complexities of natural resources management. The validity of the promoted benefits will only be known through testing of the framework, and the report concludes with recommendations for doing this.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

ACT	African Conservation Trust
AIS	Alien Invasive Species
ARC	Agricultural Research Commission
BSSA	Biodiversity Stewardship South Africa
CARA	Conservation of Agricultural Resources
CBD	Convention on Biological Diversity
CMA	Catchment Management Agency
CMF	Catchment Management Forum
CMS	Catchment Management Strategies
CoGta	Cooperative Governance Traditional Affairs
CRDP	Comprehensive Rural Development Programme
DAC	Department of Arts & Culture
DAEARD	Department of Agriculture, Environmental Affairs and Rural Development
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEAT	Department of Environment, Agriculture and Tourism
DM	District Municipality
DMA	District Management Area
DRDLR	Department of Rural Development and Land Reform
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
ECA	Environmental Conservation Act
EIA	Environmental Impact Assessment
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
ES	Ecosystem Service
ESD	Ecologically Sustainable Development
EU	European Union
EWT	Endangered Wildlife Trust
HA	Heritage Act
INRM	Integrated Natural Resource Management
ITB	Ingonyama Trust Board
IWRM	Integrated Water Resource Management
KZN	KwaZulu-Natal
LADA	Land Degradation Assessment in Drylands
LED	Local Economic Development
LG	Local Government
LM	Local Municipality
MCAA	Mountain Catchment Areas Act
MEA	Millennium Ecosystem Assessment
NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NEMPA	National Environmental Management: Protected Areas Act

NEQMA	National Air Quality Management Act
NFA	National Forest Act
NGO	Non-Governmental Organisation
NGP	National Grassland Programme
NIP	National Infrastructure Plan
NPAES	National Protected Areas Expansion Strategy
NPO	Non-Profit Organisation
NRGS	Natural Resource Governance Systems
NRM	Natural Resource Management
NSBA	National Spatial Biodiversity Assessment
NWA	National Water Act
NWRS	National Water Resource Strategy
PICC	Presidential Infrastructure Coordinating Commission
ROs	Regional Offices
RQO	Resource Quality objective
SANBI	South African National Biodiversity Institute
SEMAs	Specific Environmental Management Acts
SIPs	Strategic Integrated Projects
TWMA	Thukela Water Management Area
UDM	uThukela District Municipality
UKZN	University of KwaZulu-Natal
WAG	Wat-A-Game
WCT	Wildlands Conservation Trust
WESSA	Wildlife and Environment Society of South Africa
WfL	Working for Land
WfW	Working for Water
WfWet	Working for Wetlands
WMA	Water Management Area
WoF	Working on Fire
WRC	Water Research Commission
WSA	Water Services Act
WWF	World Wildlife Fund

1. INTRODUCTION

1.1 Background

South Africa's heightened focus on economic growth is illustrated by the country's New Growth Path, the recently released National Infrastructure Plan (NIP) and our membership of the BRICS association[1]. This national growth agenda coupled with pressure from the global economy means that our natural resources are under increasing demand to sustain economic growth while still sustaining the daily livelihoods of rural communities.

South Africa has undergone significant legal reform since 1994 to give effect to the environmental rights entrenched in the constitution. The plethora of Acts promulgated since then serves to manage negative environmental impacts from air to noise pollution, and protect the range of natural resources from water through to forests and productive land. They also protect people's rights of access and use of these resources. The sustainability model we therefore promote recognizes that a healthy environment underpins social well-being and economic prosperity. The governance framework is supposed to ensure that this model is put into practice on daily basis in terms of the planning and decisions we make about land and resource use.

However, the management of natural resources is complicated for various reasons. The interconnectedness of natural systems means management action in one impacts another, most notably water resources, which are affected by literally every action that takes place in their catchment. A further complicating factor is the need to integrate diverse user demands for resources across sectors and scales. As an example, the natural systems of the Eastern Cape's Wild Coast have significant heritage and use value to the local communities, to the broader nation in terms of the tourism, recreational and biodiversity value, and also to international mining companies seeking to extract titanium from the dunes. One also needs to account for the dynamic nature and relationships between systems, and between users and systems. Such interactions result in delays between management actions being taken and when there is a manifestation of unforeseen responses or impacts. Time is therefore another confounding factor to integrate into the management equation.

Environmental reporting is telling us that despite the best intentions of our legislation and management actions, our natural capital is being depleted, which indicates that we are failing to overcome the complex challenges inherent to NRM. Various concepts and approaches have emerged to deal with these complexities. Most notable of these is Integrated Water Resources Management (IWRM). Effective water resources management (WRM) should inherently be integrative across resources, users, scale and time. Biswas[2] (pers comm), who is noted for challenging the IWRM concept, expressed it this way, "IWRM is just good management". It is proposed here that it is because management is not integrative that the 'I' is added and the IWRM concept is established. The principles of IWRM are in line

[1] BRICS refers to the countries of Brazil, Russia, India, China and South Africa, which are all deemed to be rapidly developing economies who are projected to play an increasingly significant role in global economic power.
[2] Professor Asit Biswas: Founder of the Third World Centre for Water Management in Mexico

with the underlying principles of our National Water Act namely, social equity, economic efficiency and environmental sustainability, and we have embraced the IWRM approach in this country. However, the South African National Spatial Biodiversity Assessment (NSBA) shows that our water resources are among, if not the most degraded of our key ecosystems. This suggests that IWRM, despite the explicit requirement for involvement by all role-players, is not achieving the level of integration due partly to the obvious focus on water. Integrated Natural Resources Management (INRM) has emerged as a more holistic approach that seeks to integrate management across all resources. Achieving integration across resource types is however only one aspect of the integration challenge in NRM. The challenges of integrating across sectors, scale, stakeholders and time remain.

This project therefore proposes a new framework for INRM in South Africa that seeks to move from IWRM to INRM. This project builds on and consolidates the research and findings from the EU funded Afromaison Project[3], which is concerned with improved INRM at the 'meso-scale' in Africa. The aim of the Afromaison project is to develop adaptive and integrated tools and strategies for natural resources management. The approach and tools coming out of the Afromaison project have been developed based on comparison of lessons learnt from investigating and applying different tools in five case studies across Africa, namely Tunisia (Oum Zessar Watershed), Mali, (Inner Niger Delta), Ethiopia (headwaters of the Blue Nile), Uganda (Rwenzori Mountains) and South Africa (Drakensberg).

It is appreciated that radical changes in governance framework are unlikely. So while the proposed INRM framework includes a new institutional structure, it is designed in a manner that supports and gives effect to the existing NRM framework which has integration as its core intent. It aims to do so without adding substantially to the administrative burden, which is one of the issues weighing down NRM managers. The framework is located at the District Municipal level where policy meets action and it is argued that it is most important that integration is achieved.

By adding the "I" to NRM we aim to raise the importance of integration in the minds of those responsible for doing so. But merely heightening awareness does not translate to integration on the ground. This is why we equip stakeholders with guidance and tools under the banner of an approach such as IWRM. The Global Water Partnership, IWRM Toolbox is a good example of this[4]. Afromaison has developed tools and guidance to improve INRM at the selected scale. However, like many research projects, the outputs of Afromaison are fairly generic to Africa and their application in specific countries is limited unless they are refined to be specific enough. Importantly, an attempt has been made in the South African case study to convert the innovative and unique elements of the Afromaison approach to concrete mechanisms and tools that can be applied in entrenching 'integration' within the SA NRM governance structure so that we don't have to tag on the 'I'.

[3] AFRICA AT MESO-SCALE: Adaptive and integrated tools and strategies for natural resources management. Financed by: European Commission 7FP / Coordination: Antea Group (Belgium) / Date: 2010-2013 / Budget: € 4 160 000 www.afromaison.net

[4] http://www.gwp.org/en/ToolBox/

In addition to the considerable wealth of work in Afromaison, the report also draws on the work of another Water Research Commission (WRC) project entitled "Natural Resource Governance Systems" (NRGS) (Pegasys, 2013). Given that the NRGS project being ahead in terms of progress, the intention was to add to the ideas and discussion presented in the thorough review of the INRM concept based on consideration of international case studies undertaken by Pegasys.

This report has the following structure with motivation provided as follows:

- Chapter 1: Provides a definition of natural resources and the concept of INRM, discusses the complex nature of NRM and presents principles that should guide NRM.

- Chapter 2: Provides background to the Afromaison project which is important context given that the development of the INRM framework has taken place within the thinking framed by this project.

- Chapter 3: Presents the Governance Framework for NRM within South Africa. This is important context for the analysis and discussion regarding the barriers to integrated management that follows. This chapter also summarises the state of our natural resources and motivates the need for a new approach to NRM. It concludes with an overview of the uThukela District Municipality and why it is a very useful case for developing new thinking around improved integration in NRM. This specific context is useful because the local context within the case study area is referenced in the discussion that follows.

- Chapter 4: The key challenges to achieving integration in natural resources management are presented based on an analysis of the experiences form the Uthukela District Municipality and the NRM Governance framework presented in the previous chapter.

- Chapter 5: The proposed INRM framework is constructed in this chapter, one element at a time. This is done by explaining how the element, tool or concept of the NRM concept is designed to overcome the barriers or issues disused in chapter 4 and entrench Integration within NRM practice.

- Chapter 6: The various elements of the INRM framework discussed in Chapter 5 are combined in documenting the value of the framework as a whole to demonstrate how the specific elements support each other in achieving integration.

- Chapter 7: The report concludes by presenting recommendations and suggestions for exploring this framework further through a pilot case study.

1.2 Understanding Natural Resources Management

1.2.1 Defining Natural Resources

There are various definitions for natural resources based, among other factors, on the value ascribed to their use. Pegasys (2013) present the commonly used economic and environmental definitions of natural resources (Table 1Error! Reference source not found.).

Table 1: Economic and environmental definitions of natural resources (Source: Pegasys, 2013)

Natural Resources include minerals, forests and biota, water, fertile land, air that occur in nature and can be used for economic gain. A material source of wealth, such as timber, fresh water, or a mineral deposit, that occurs in a natural state and has economic value.	Economic definition
Natural resources occur naturally within environments that exist relatively undisturbed by mankind. A natural resource is often characterised by amounts of biodiversity and geodiversity existent in various ecosystems.	Environmental Definition

1.2.2 The Complex Nature of Natural Resources Management

As discussed in the Pegasys (2013) report, the "wicked" problems of natural resource management as defined by Rittel and Webber (1973), refers to problems that 'defy efforts to delineate their boundaries and to identify their causes, and thus expose their problematic nature'. Therefore, this indicates that problems are difficult to address due to the changing, contradictory or incomplete requirements on which they are based. This resistance to resolution stems from the notion that the solution of a single element is likely to create challenges or problems in others. This is a challenge within natural resource management as no problem is unique is likely to have stemmed from the resolution of another element (Rittel and Webber, 1973). Due to this range of unique challenges, it is evident that no single body can adequately solve these wicked NRM problems. Therefore, there is a need for collective responsibility through stakeholder consultation and assistance from society as government cannot achieve resolution alone. This further highlights the need for a new governance approach that involves a range of stakeholders to be involved to achieve solutions in this complex sector.

1.2.3 Defining Integrated Natural Resources Management

Ochala et al. (2010) defines INRM as follows: "An approach that integrates research of different types of natural resources into stakeholder-driven processes of adaptive management and innovation to improve livelihoods, agro-ecosystems resilience, agriculture productivity and environmental services at community, eco-regional and global scales of intervention and impact".

As highlighted in the definition above, INRM requires integration across resource types, stakeholders, scale and time to come to terms with the wicked or complex nature of the management challenge.

1.2.4 Principles of NRM Governance

Governance principles of NRM are defined by Lockwood et al. (n.d.) as "normative statements that make claims about how governing or steering should happen and in what direction – that is, how

governance actors should exercise their powers in meeting their objectives". Pegasys (2013) presented the following (Table 2) principles of NRM governance based on several reviewed case studies.

Table 2: Principles of NRM Governance (Source: Pegasys, 2013)

PRINCIPLE	ELEMENTS OF THE PRINCIPLE
Participation	All citizens, both men and women, should have a voice – directly or through intermediate organizations representing their interests – throughout processes of policy and decision-making. Broad participation hinges upon national and local governments following an inclusive approach.
Transparency	Information should flow freely within a society. The various processes and decisions should be transparent and open for scrutiny by the public. Processes, institutions and information are clear and directly accessible.
Equity	All groups in society, both men and women, should have opportunities to improve their well-being.
Accountability	Governments, the private sector and civil society organizations should be accountable to the public or the interests they are representing.
Coherency	The increasing complexity of natural resource issues, appropriate policies and actions must be taken into account so that they become coherent, consistent and easily understood.
Responsiveness	Institutions and processes should serve all stakeholders and respond efficiently to changes in demand and preferences, or other new circumstances. Needs of all stakeholders are taken into account
Integrative	Natural resources governance should enhance and promote integrated and holistic approaches.
Ethical considerations	Natural Resources governance has to be based on the ethical principles of the society in which it functions, for example by respecting traditional water/land rights and preventing corruption.
Predictability	of the political and administrative governance system, in that all role players know the rules and accept that these will be applied consistently
Legitimacy	Integrity and commitment: of all stakeholders. Authority and representativity: The governing body and its members have legitimate, democratically mandated authority. Legitimacy: The governing body and/or its members have long-standing cultural attachment to the area. The governing body follows its mandate.
Direction	Strategic vision: broad and long term perspectives on good governance
Performance	Effectiveness and efficiency: Needs are met while making best use if resources Capacities: All stakeholders have capacities to engage in governance Financial sustainability of processes and results Subsidiarity: Power and decisions rest at the lowest level Resilience: the governing body can be flexible, learn and adapt
Fairness	Equity: Costs and benefits are equitably shared Rule of law: legal frameworks are fair and enforced impartially Human Rights and cultural practices are respected Do no harm: Local livelihoods are not adversely affected Effective and appropriate conflict resolution: There is recourse to impartial judgment in the case of conflict Access to justice: Legal assistance is available to all stakeholders

These principles are reflected on in building the case for the Afromaison approach and the resulting INRM framework proposed for the South African context.

2. AFROMAISON PROJECT

2.1 Project Aims and Structure

This chapter provides background to the Afromaison project which developed the approach and key elements considered necessary for achieving integration in NRM. The project focuses on INRM at the meso-scale in Africa. The meso-scale sits between the national scale, where overall strategic priorities are set and where context (policy, resources) are defined (enabling environment), and the local scale, where national policy is implemented and local actions co-ordinated. The meso-scale was defined differently in the various case study countries.

The Afromaison project is divided into eight work packages (WPs), with each having tasks that integrate with the other WPs. Work Package 1 (WP1) is the main coordination and managing aspects of Afromaison, ensuring that the credentials of the proposal are met. WP2-WP7 formulates the research aspect of the project, whose outcomes are integrated into WP8, the final dissemination package of the project. All of the WPs are integrated to ensure that the development and findings of each is not conducted in isolation, but rather to formulate an integrated outcome. A basic outline of each WP is demonstrated below.

- WP1: Project management.
- WP2: Conducting a multi-disciplinary assessment of the context of the specific case study, across scale, sectors and disciplines.
- WP3-6: Utilizing the product of WP2, these WPs focussed on specific tools and contributed to the main objective, of an integrated set of tools and strategies.
    - WP3: focuses on identifying appropriate rehabilitation and management strategies for natural resources.
    - WP4: Concentrated on economic and non-monetary tools, and incentives for their implementation
    - WP5: Looked at tools for spatial planning and how they best integrate natural resources values, threats and consider change over time.
    - WP6: Assesses and maps the vulnerability of the case studies to global changes (climate change).
- WP7: Stakeholder engagement and monitoring changes in understanding, perception and behaviour with regards to INRM throughout the project life cycle. Also developed methodologies to evaluate the operational performance of the tools and strategies for INRM as well as create a toolbox that encompasses the strategies into a toolbox.
- WP8: Dissemination, capacity building and end-user involvement of the research outcomes. The key aim is to integrate the projects outcomes in the case studies' authorities and institutes as well as international institutes and platforms, which is achieved through strong networking and capacity building.

Figure 1 below demonstrates the workplan of the Afromaison project, indicating how the 8 WPs integrate to create a holistic set of tools and strategies.

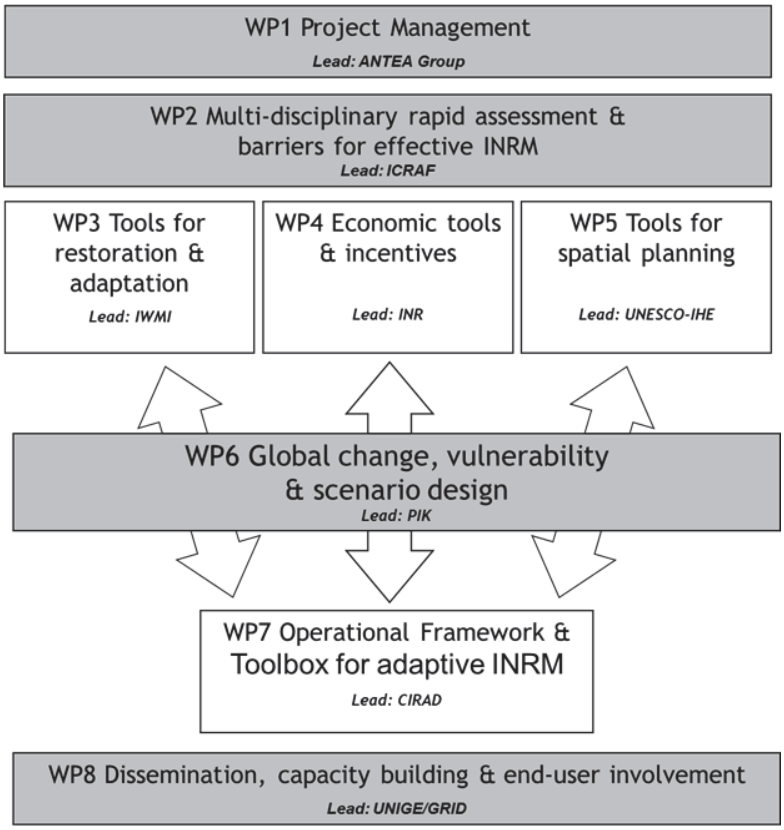


Figure 1: Overview of Afromaison Workplan (Source: Afromaison, 2014)

The Afromaison proposal identified several key elements, motivated to be essential requirements for achieving integration in NRM. It is these that have been developed through the South African Case study specifically for the local governance context. The five pegs on which the Afromaison approach is hung are:

i. An ecosystem services approach as the foundation to the framework.
ii. Integrating at the Meso-scale.
iii. Ensuring effective institutional arrangements are in place.
iv. The use of economic instruments to create financial incentives necessary to change management behaviour and sustain it in the long run.
v. Effective involvement of stakeholders.

These key elements assist in overcoming one or more of the challenges of integrating across scale, users, time and resources. The approach involved the development of tools to support the application of these elements. In addition to the key elements, there are other important concepts to consider in improving NRM, such as identifying not only the symptom, but also the cause of resource degradation.

2.2 The UThukela District – A Useful Case for Analysing the Challenges to INRM

In the South African Case Study, the meso-scale has been defined as the District Municipality level. The uThukela District Municipality (DM), located along the western boundary between KwaZulu-Natal and Lesotho, was selected as the study area because of the importance of its natural systems across scale and users. In addition, the social and political systems, and the institutional arrangements within which management of these important resources needs to be achieved, are complex. In short, it is a challenging case in which to integrate. The section provides more background about the UThukela District Municipality (UDM) as context for the analysis that follows.

2.2.1 Overview of the UThukela District Municipality

The UDM is one of ten District Municipalities in the KwaZulu-Natal (KZN) Province and is approximately 11 500km² in extent. The UDM consists of five local Municipalities namely, Indaka, Emnambithi/Ladysmith, Umtshezi, Okhahlamba and Imbabazane Local Municipalities. The uKhahlamba-Drakensberg Park, which is a world heritage site, occurs within the western boundaries of the Okhahlamba and Imbabazane Local Municipalities, and forms the border between South Africa and Lesotho (Figure 2). The UDM is predominately rural in character (approx. 70%) with rural and urban settlements covering 3.5% of the land. 55.8% land is covered with grasslands while 18.3 % of the land cover is bushland. About 13% of the land cover accounts for commercial and subsistence agriculture (DSPED, 2010). The Municipality is characterized by socio-economic challenges such as a low revenue base, poorly maintained infrastructure and limited access to social and other service s. High levels of poverty, unemployment, skills shortages, a lack of resources and low levels of education are also prevalent. Further detail on this overview is provided below.

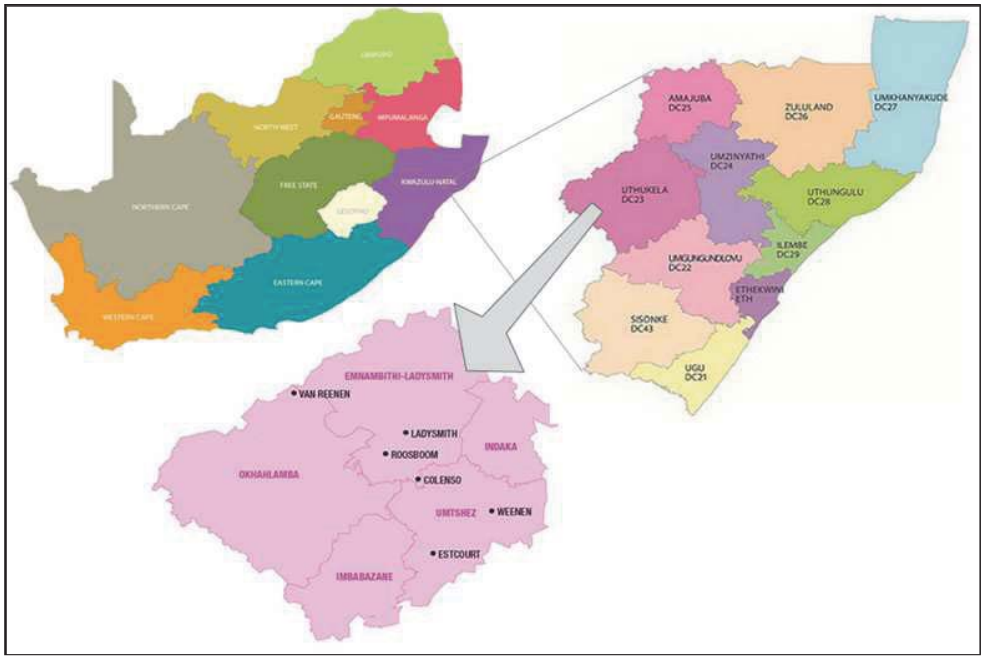


Figure 2: Location of the uThukela District Municipality

The spatial development framework presented as Figure 3, provides a good spatial overview of the biophysical, urban, infrastructural features and administrative boundaries within the municipality described above.

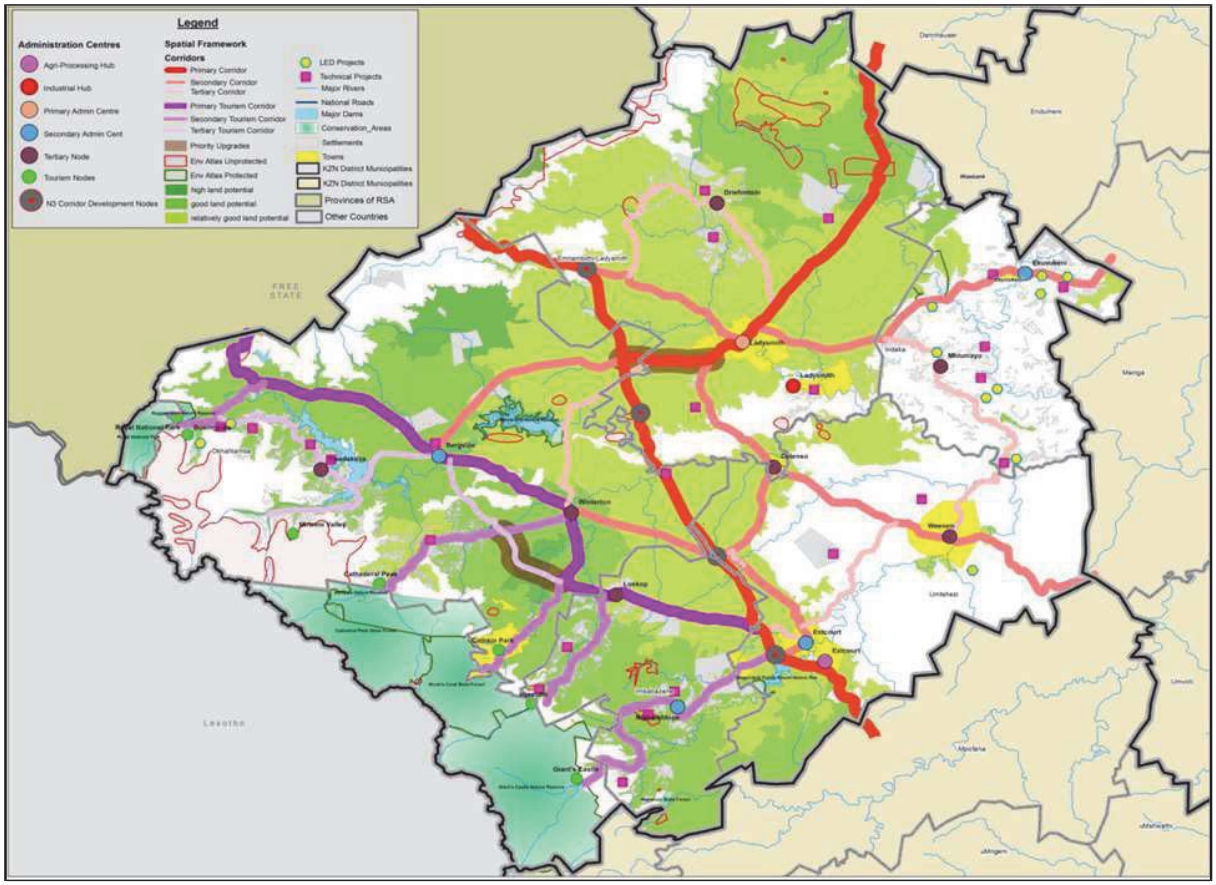


Figure 3: Spatial Development Framework for the UDM (Source: UDM, 2011)

2.2.2 The Drakensberg Mountain Range

The Drakensberg Mountain Range is an extensive mass of basalt and sandstone that stretches from the Eastern Cape in the south through KwaZulu-Natal, the Free State, Mpumalanga and into the Limpopo province in the north. There exists an extreme range in altitude and diverse topography and geology. This has resulted in a rich diversity of habitats, fauna and flora, which includes local endemic and threatened species. The area also includes a rich cultural heritage left by the San. In addition to this internationally significant natural and cultural heritage, the KwaZulu-Natal Drakensberg is of significant economic importance to South Africa through the valuable ecosystem services that it produces. The most significant being water services, which are becoming increasingly more important as the country's water resources become over-subscribed. The rich biodiversity and cultural value of the Drakensberg is the basis for its World Heritage Status. The Park is a major asset in terms of attracting both national and international tourists (Figure 4).

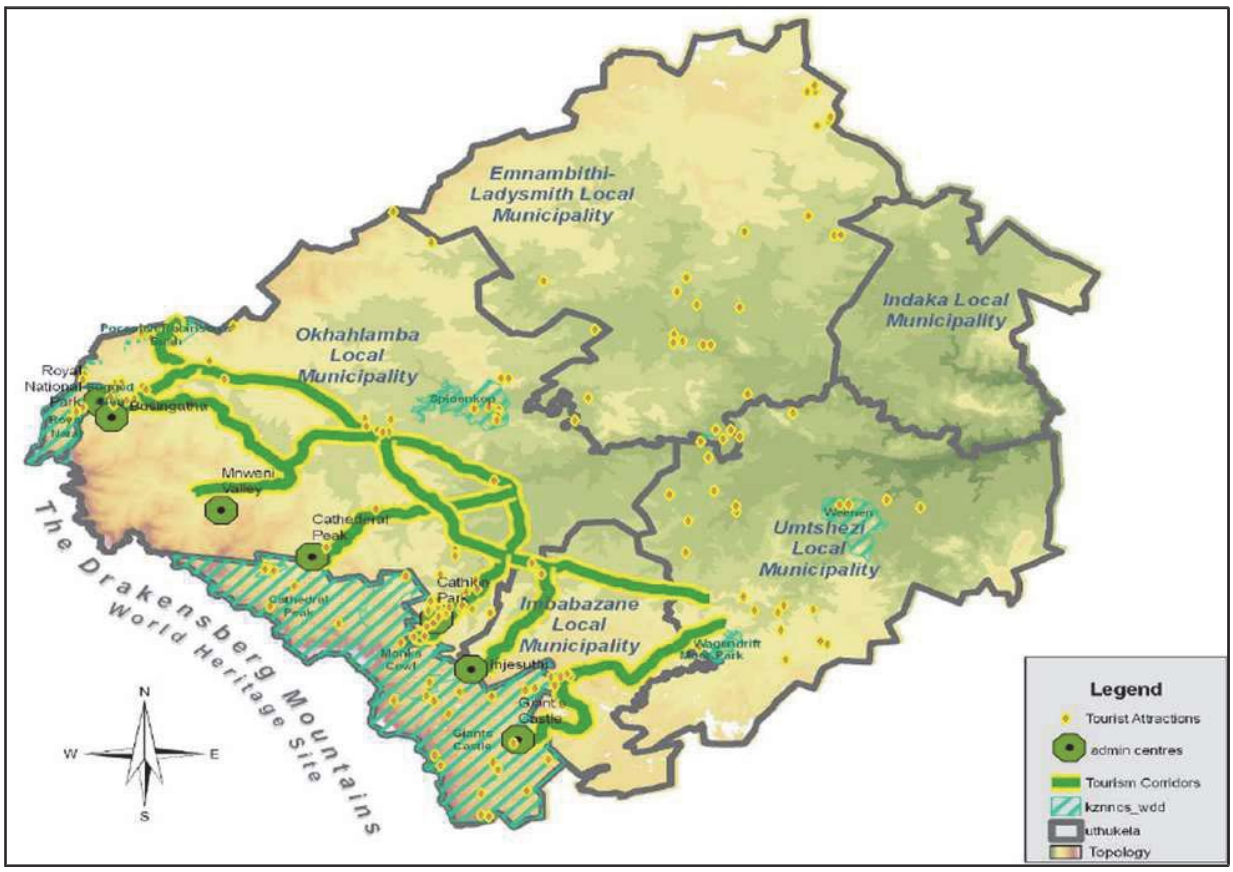


Figure 4: Location and extent of the World Heritage Site, other protected areas and tourist attractions in the UDM (Source: UDM, 2011)

2.2.3 Upper Thukela sub-catchment

The Upper Thukela sub-catchment lies in the upper reaches of the Thukela River. The towns of Bergville, Ladysmith, Colenso and Weenen are located here. The Thukela and Klip Rivers are the main rivers in this catchment. This area is the source of water for the Thukela-Vaal Transfer Scheme, which, inter alia, transfers water to the Vaal River System. The transfer capacity of this scheme represents a large portion (about 30%) of the water resources available in the Upper Vaal WMA, which is the economic heart of South Africa. Over the last few years, the system has been operating below capacity due to the implementation of the Lesotho Highlands Water Project and the preferred utilisation of this gravity feed resource as opposed to the pumping of water through the Thukela-Vaal Transfer Scheme. The Scheme is now used by Eskom to generate hydro-electricity while large volumes of water remain available to augment Gauteng's supply.

2.2.4 Land Cover / Land Use

The uThukela District Municipality is predominately rural (approximately 70%), with a dispersed rural settlement (DSPED, 2010). Settlements (including urban and rural settlements) cover 3.5% of the land.

Agriculture (cultivated land and stock farming) is the major land use in the uThukela District. Agriculture in terms of cultivated land makes up 13% of the land cover when combining commercial (7.9%) and subsistence agriculture (5.1 %). Stock farming, including beef and dairy cattle, sheep and game is primarily related to bushland and grassland areas which covers 74.1% of the land. Although, this value includes degraded grassland and bushland areas which would not be used for farming (DSPED, 2010). Large tracts of land are owned by a relatively small number of commercial farmers with average farm sizes of greater than 700 hectares and frequently with access to river water for supplementary irrigation. In the rural areas, dryland subsistence agriculture and pastoralism are the dominant land uses since few of the rural communities have access to irrigation water (BEEH, 2004). Subsistence farming and overgrazing in areas of poor and relatively unproductive land has resulted in large tracts of degraded land.

2.2.5 Land Tenure

There are three main types of land ownership systems in the uThukela District Municipality (Figure 5). The formally protected areas managed by the provincial conservation authority, Ezemvelo KZN Wildlife District Management. The World Heritage Site is approximately 87,400 ha or 8% of the total area of the district). Commercial farms are under “freehold” tenure. The farms are primarily owned and managed as commercial farming entities by individual farmers, trusts and companies, and presently cover an area of approximately 600,000 ha or 53% of the total land area of the district (UDM, 2011).

Communal land is under communal land tenure. In terms of overall ownership, such traditional lands and land reform areas account for approximately 40% of all land (in the UDM). Traditional lands are referred to as Traditional Authority, while freehold settlements, land reform transferred projects and settled restitution areas fall under different aspects of the Land Reform Programme of the Department of Rural Development and Land Affairs. Indaka and Imbabazane Local Municipalities have by far the largest share in traditional land, with areas as high as 83% being traditional land. On the other hand, the Emnambithi and Umtshezi Local Municipalities have the smallest percentage of traditional land. From 1994 to 2007, a total of 55,523 hectares of land were transferred to 8,450 beneficiaries via the Land Reform Programme. The largest share of land in the UDM was transferred in Umtshezi (50%), followed by Emnambithi (43%), accounting for approximately 93% of all land transferred. A single project (in Besters) accounted for the large portion of land (15,675 ha) transferred in Emnambithi during 2005. Only 1% of land has been transferred in Imbabazane and 6% in Umtshezi (DSPED, 2010).

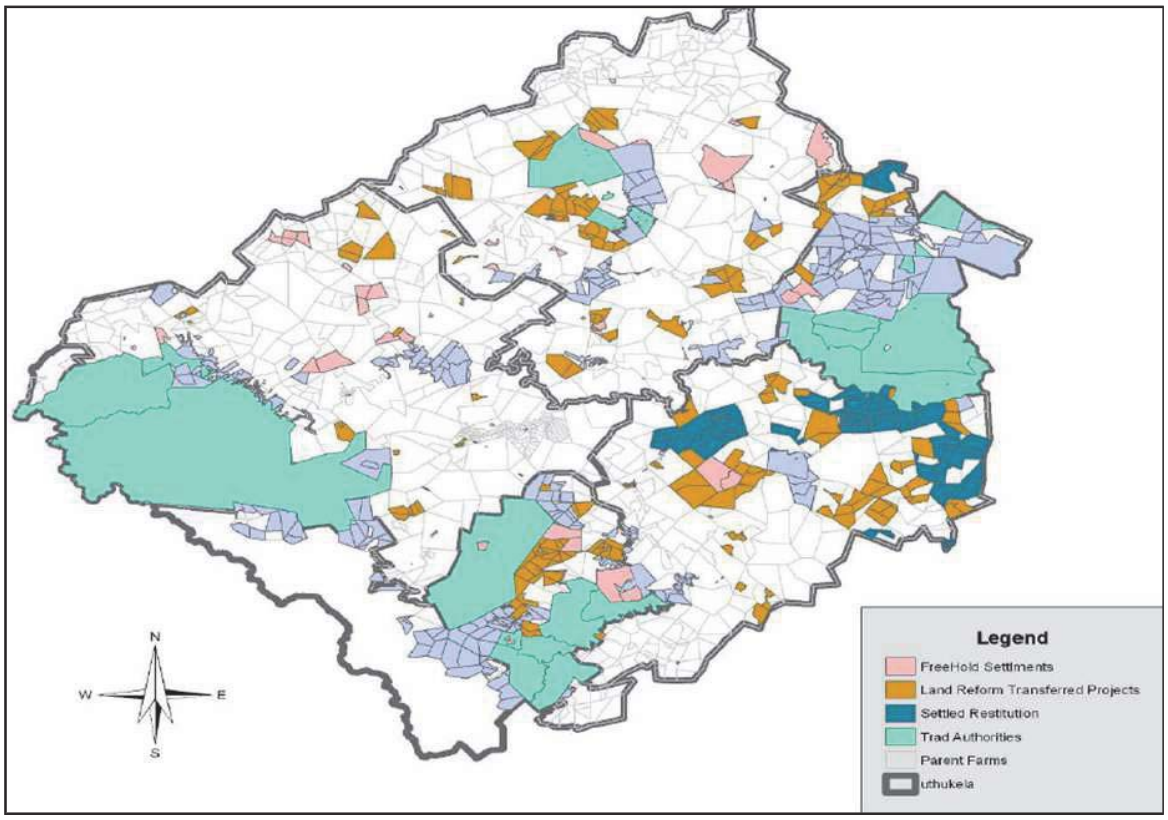


Figure 5: Overview of land tenure within the UThukela District Municipality (Source: UDM, 2011)

2.2.6 Socio-Economic Characteristics

There were 714 909 people living in the UDM in 2007, which accounted for 7% of the Province. Population density is about 63 people per km^2. The total population increased by 8.8% from 2001 to 2007. The largest population portion of the population resides in the Emnambithi/Ladysmith Local Municipality (DSPED, 2010).

More than 60% of the population is between the ages of 5 and 34 years, reflecting a high proportion of children and youth. It also shows a tapering off of adults, indicating two trends: out migration of economically active people, and the impact of HIV/AIDS-related deaths. The lower proportion of men to women (46:54) would support the former explanation, as men continue to leave the area and follow historical migrancy patterns. Life expectancy in the district is low, and explains the low population growth rate. The population structure of the district municipality poses a number of challenges. Firstly, the district has a young population that accounts for more than 60% of the total district municipality. Secondly, the economically active population accounts for only 36% of the district population.

The spatial variation in poverty levels are shown in Figure 6 below. What is evident is that they correspond very closely with the areas under communal tenure shown in the preceding Figure 5, where there are relatively large numbers of people living in relatively high density, with associated cattle, crops and low levels of basic infrastructure. This translates to high pressure on resources in these areas.

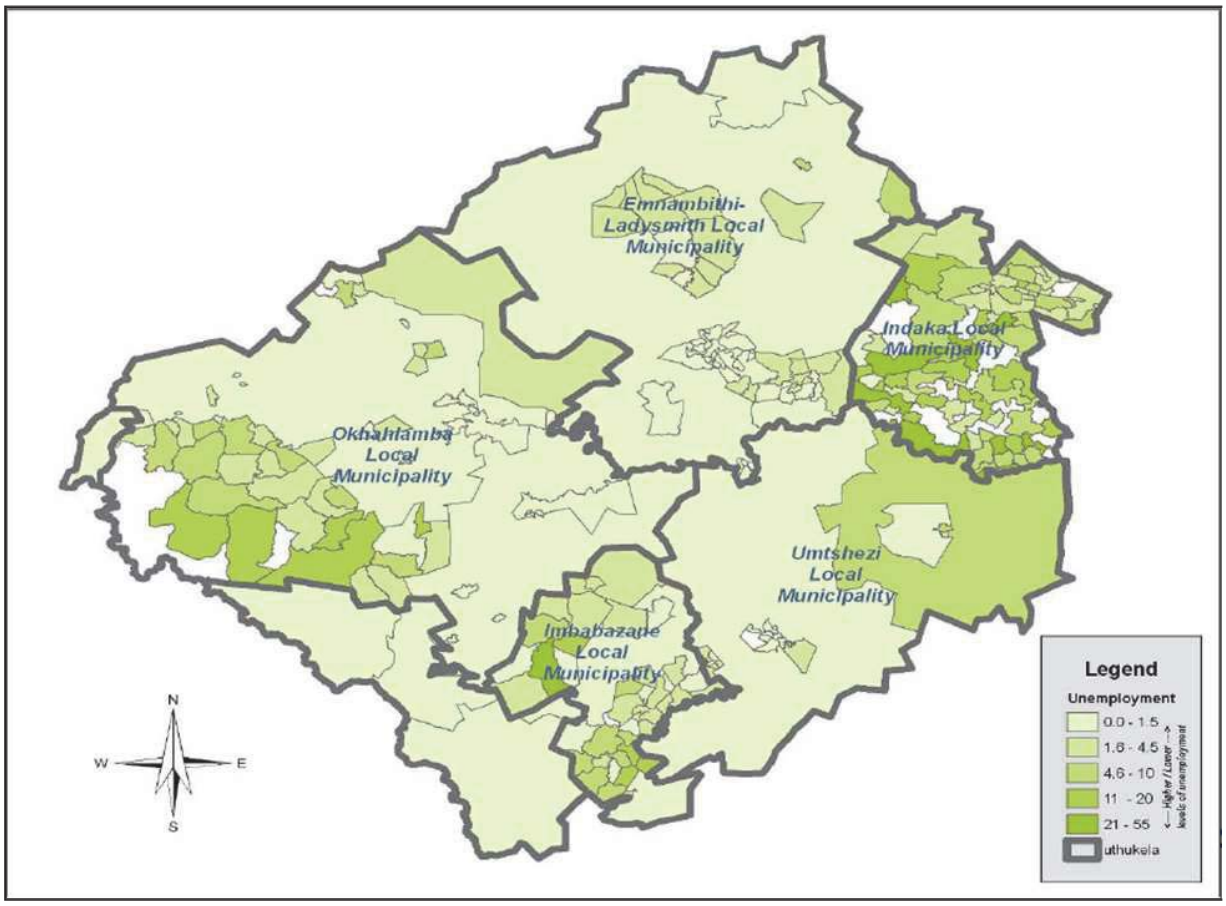


Figure 6: Spatial distribution of poverty levels across the UDM (Source: UDM, 2011)

2.2.7 Natural Resource Management Structures and Initiatives

2.2.7.1 Local Governance Context

There is a complex mosaic of conflicting mandates and responsibilities, most notably in the Buffer Zone to the World Heritage Site. The relevant actors, their mandate and responsibilities are listed below:

- Local Government: District and Local Municipalities are technically responsible for land-use planning and decision making throughout the entire district, including the WHS (although in reality this is left to the management agency to handle in terms of the Management Plan), and the buffer zone to the World Heritage Site. Local government is under significant pressure to deliver basic services and generate economic growth in terms of the Local Economic Development (LED) mandates. These are viewed as their core mandates and sustainability is not yet integrated into the understanding regarding their delivery.
- Traditional Leadership: are responsible for the residents' land and resource use within the traditional areas based on traditional norms, which often conflict with the aims, objectives and authority of the local government administration.
- The Ingonyama Trust Board (ITB): is responsible for (with agreement from the Traditional structures) signing off on lease or use of land by external roleplayers in communal tenure areas.

- Ezemvelo KZN Wildlife (EKZNW): have a conservation mandate and view on land and resource use. They have been delegated the management authority for the WHS in terms of the World Heritage Act. In terms of this mandate, EKZNW are thereby also responsible for delineating the buffer zone around the WHS. They chaired the multi stakeholder Buffer Technical Committee which was established to delineate the WHS buffer zone and associated controls within these zones.

2.2.7.2 NRM Initiatives

There is a considerable range and number of resource management activities being undertaken in the District, much of which is focussed on rehabilitation of degraded areas under traditional land ownership and falls within the World Heritage Site buffer area (Figure 7). The following summary covers the roleplayers acting in the area as well as the nature of their activities and level of their collaboration or integration.

African Conservation Trust (ACT)[5] – Mountain Range Rehabilitation Project

ACT is an NGO working in the Mweni and Amazizi communal areas. Their project aimed to conserve mountain streams, remove alien weeds, replant indigenous vegetation, prevent soil erosion and repair dongas. ACT also contributed to the process of establishing a community-owned conservation buffer zone along the borders with the WHS, and develop tourism related infrastructure in this zone to generate an income for local communities. They have collaborated with a range of roleplayers in the area including the Wilderness Group and Ezemvelo KZN Wildlife (EKZNW). The ACT projects came to a halt when their National Lottery funding recently ran out, although it is understood they are expecting more funding in the near future.

Wildlands Conservation Trust (WCT) – UThukela Initiative: Upper UThukela CEBA6

Through funding secured through DEA (Department of Environmental Affairs) and the NRM (Natural Resource Management) Project, their team working in this area has reportedly increased from 3 to 36 in the last year, including 1 SANBI (South African National Biodiversity Institute) intern, 2 supervisors and a restoration team of 33, who have been employed on a full time basis. This restoration team focuses on donga rehabilitation and protecting grasslands through appropriate fire breaks and fire management.

Wilderness Action Group (WAG)[7]

The WAG is a small Non-Profit Organisation (NPO) which "promotes wilderness conservation, both regionally and internationally". They have been an important link between the various other NPOs such as ACT and EKZNW in working with the local communities. The role of the WAG as a go between communities and other actors stems from the trust placed in them by the local communities.

[5] http://www.projectafrica.com/
[6] http://www.wildlands.co.za/activities/uthukela-initiative/
[7] http://www.wilderness.org.za/

Government Natural Resources Management Programmes

There are the LandCare[8] projects which are community based programmes that are supported by the public and private sector through a series of partnerships. LandCare focuses on conservation of natural resources through the promotion of sustainable use, addresses rural poverty through sustainable job creation and develops a conservation ethic through education and awareness. There are also invasive alien species clearing projects under the Working for Water[9] Programme.

University of KwaZulu-Natal (UKZN) – Land Rehabilitation and Monitoring Research.

The UKZN has worked in this area over a relatively extended period on the development of appropriate rehabilitation and monitoring techniques for the rural context and grasslands within this mountainous area – specifically in the Okhombe. They have undertaken training with the local communities in both aspects, which has been funded by the Water Research Commission (WRC) and the Working for Wetlands (WfWet) Programme. UKZN have also worked closely with the EKZNW Wildlife over this time.

Agricultural Associations – No-till Club/Conservation Farming[10]

The Bergville and Colenso farming areas are the forerunners in the development of "no-till' farming practices and associated 'conservation farming' methods. They have taken this concept forward due to the real financial benefits that are being realized by the members of these farmers associations. The approach has grown to the extent that there is now a 'No-Till Club' that hosts events and an annual conference, which has support from the broader sector.

The following can be noted regarding the type and level of collaboration in the area:

- As shown in Figure 7, there is a fair amount of overlap between the various rehabilitation efforts with several being in the same general area and, in certain instances, the same catchment.
- There has been a fair level of multilateral interaction between the different types of actors, i.e. Non-Governmental Organisations (NGOs), research and government agencies (both conservation and NRM programmes).
- All the NGOs and research organisations reported that funding shortages have either stopped or limited the focus and scale of work.
- In terms of co-ordination, ACT were instrumental in establishing the 'Synergy Group', which was an informal forum inclusive of government departments and NGOs who have an interest or mandate in the area to co-ordinate actions. This forum has ceased to operate when ACT's funding came to an end. Its usefulness was also hampered by the frequent failure of government departments to attend.

[8] http://www.nda.agric.za/docs/landcarepage/landcare.htm
[9] http://www.dwaf.gov.za/wfw/
[10] http://notillclub.com/

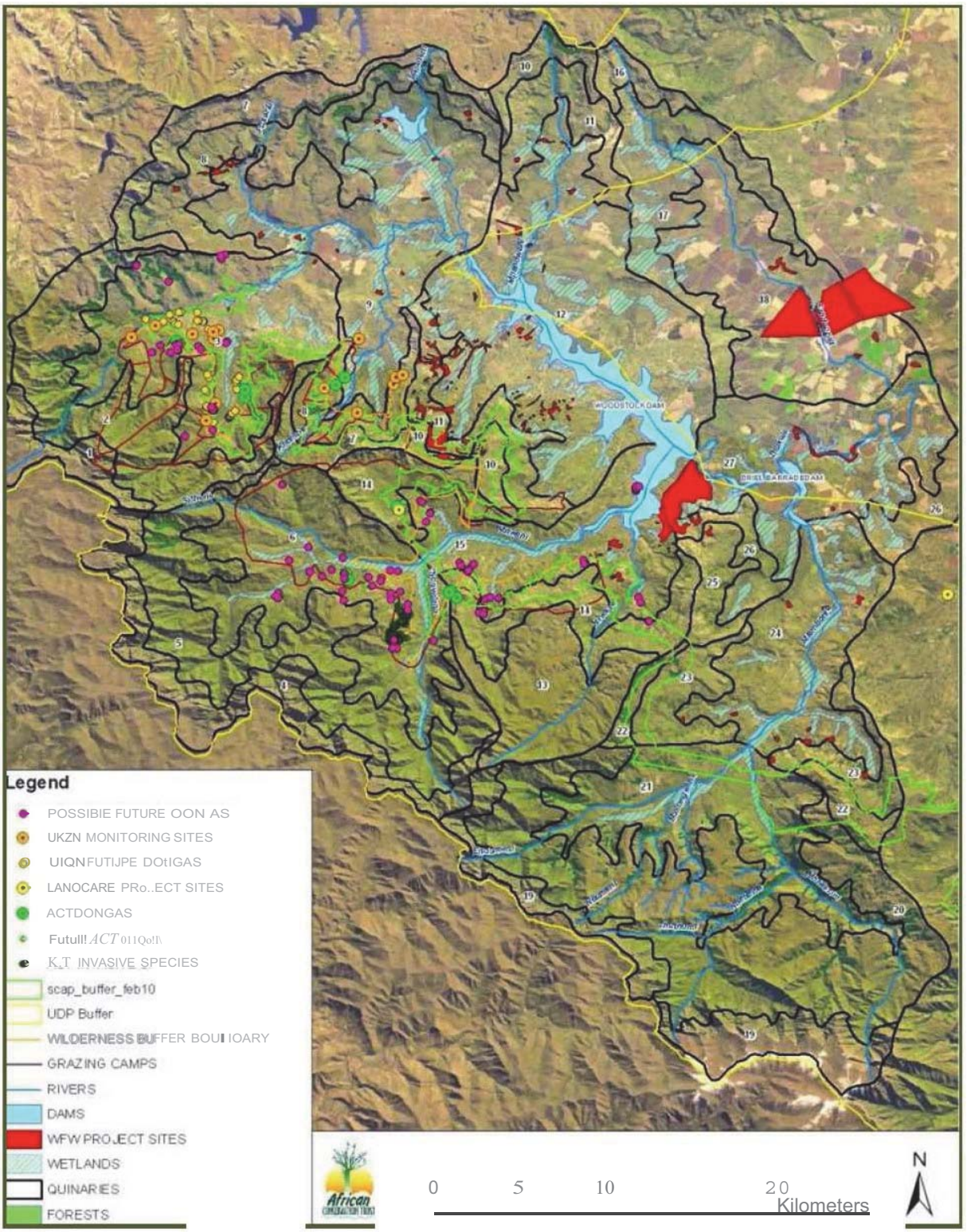


Figure 7: Spatial overview of natural resource management initiatives implemented by a range of stakeholders in the Upper Thukela River Catchment on land under traditional tenure and located in the buffer area to the World Heritage Site

Subsequently, there is a situation in the buffer zone where all of the institutions listed above, have somewhat differing mandates and some level of authority or influence with regards to land and resource planning and use. Underlying the apparent friction within this institutional framework are socio-political issues that are often founded in historical events and further complicate efforts to co-ordinate planning and action. These underlying issues are analysed in more detail in Chapter 4.
This highlights the essential need for clear and effective institutional structures.

2.2.8 Summary

The uThukela District Municipality provides a useful case in which to analyse the challenges of improved NRM given:

- High value natural resources with competing demands at different scales: including a World Heritage Site with significant biodiversity, cultural heritage and internationally renowned tourism value, as well as one of largest water catchments in the country and extremely high value agricultural production areas. There is competition for use of resources between local users (livelihoods) and agricultural production as well as international demands from the tourism sector and biodiversity conservation required for maintaining good condition natural systems.
- Complex INRM Institutional Framework: the area includes a full range of overlapping institutional structures governing land-use planning and management, including traditional management systems, political systems and the implications of the World Heritage Site legislation, overlain with Municipal planning, Local Economic development and service delivery mandates. These are further complicated by the range of socio-political and tenure systems.
- A range of NRM programmes and initiatives: involving a diversity of actors across this area and examples of collaboration between them. But as will be discussed in more detail later, there are questions about the sustainability and effectiveness of these efforts.

This area therefore makes for a good case study for overcoming complex institutional and socio-political challenges in achieving integration.

3. THE NRM GOVERNANCE CONTEXT

This chapter describes the broader, country level context which is also analysed in Chapter 4 when building the motivation for a new approach and constructing the proposed framework. It therefore provides important context.

3.1 The Legal Framework

Recognition of the value of natural resources to human well-being and economic prosperity is no-where more evident than in South Africa and our legal reform process that has flowed from the Constitution Act of 1996 (Section 24), which establishes everyone's right to (South Africa.info, 2011):

- an environment that is not harmful to their health or well-being; and
- to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and economical degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

The White Paper in Environmental Management Policy has established a framework for modern environmental policy in South Africa to address the crucial aspects of governance. Here, sustainability is an essential requirement for effective environmental governance and include:

- The need to develop and implement an environmental strategy and action plan, and enact legislation that establishes norms and standards.
- The inclusion of effective public participation.
- The requirement of governance to be responsible and accountable.
- Effective integration and co-operation with all role players in environmental management.
- An integrated and comprehensive regulatory system.
- The need to develop information systems to collect and process information and disseminate it to interested citizens.

The recommendations and principles of the White Paper culminated in the National Environmental Management Act (NEMA-No. 107 of 1998) provides the umbrella framework legislation for the environmental law reform programme of the National Department of Environmental Affairs and Tourism (DAEA&RD, 2010). NEMA provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of State (DAEA&RD, 2010). A consolidated legislative framework for environmental management was developed through law reform programme following the adoption of NEMA. A suite of laws were developed under NEMA. These address aspects of biodiversity and heritage, environmental quality and protection, and the implementation of NEMA. The concept of sustainable development is embedded in a number of these sectoral laws as well as other non-environmental sectoral laws such as those of the Health, Transport and Local Government sectors (DAEA&RD, 2010).

The three spheres of government, namely National, Provincial and Local Government, are tasked with administrative functions as set out by the Constitution. Schedule 4 and 5 of the Constitution assigns concurrent legislative competence to National and Provincial Government for most of the functions relevant to environmental management (DAEA&RD, 2010). Both national and provincial spheres of government therefore have designated authority to administer laws and create mechanisms which promote and regulate all aspects of environmental management (DAEA&RD, 2010). Therefore many of the laws detailed in Table 3 below apply to all spheres of government and have bearing on Natural Resource Management (NRM).

Table 3 below demonstrates the key national environmental legislation which guides environmental governance in South Africa. Each province is responsible for the enforcement of such legislation, with the freedom to add further legislation if they desire.

Table 3: Key national environmental legislation which guides environmental governance in South Africa

ACT	OBJECTIVE / RESPONSIBLE INSTITUTION
The National Environmental Management Act (No. 107 of 1998) (NEMA)	To provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state; to provide for certain aspects of the administration and enforcement of other environmental management laws; and to provide for matters connected therewith. Provides Environmental Impact Assessment (EIA) regulations The Department of Environment Affairs (DEA) and the Department of Environment, Agriculture & Rural Development (DEARD) are the responsible for the implementing NEMA at a national and provincial level respectively.
The Environment Conservation Act (No. 73 of 1989) (ECA)	To provide for the effective protection and controlled utilization of the environment and for matters incidental thereto. The Department of Environment (DEA) is responsible at a national level.
Management: Biodiversity Act (No. 10 of 2004) (NEMBA)	To provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act1, 998; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute; and for matters connected therewith. The Department of Environment (DEA) and the South African Biodiversity Institute (SANBI) are responsible at a national level and Ezemvelo KZN Wildlife (EKZNW) is responsible at a provincial level.
National Environmental Management: Protected Areas Act (No. 57 of 2003) (NEMPA)	To provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; and for matters in connection therewith. The Department of Environment Affairs (DEA) is responsible at a national level and Ezemvelo KZN Wildlife (EKZNW) is responsible at a provincial level.
The National Water Act (No. 36 of 1998) (NWA)	To ensure the protection, use, development, conservation, management, and control of water resources in a sustainable and equitable manner.

	The Department of Water Affairs (DWA) is responsible at a national and provincial level.
The Water Services Act (No. 108 of 1997)	To provide for the rights of access to basic water supply and basic sanitation; to provide for the setting of national standards and of norms and standards for tariffs; to provide for water services development plans; to provide a regulatory framework for water services institutions and water services intermediaries; to provide for the establishment and disestablishment of water boards and water services committees and their powers and duties; to provide for the monitoring of water services and intervention by the Minister or by the relevant Province; to provide for financial assistance to water services institutions; to provide for certain general powers of the Minister; to provide for the gathering of information in a national information system and the distribution of information; to repeal certain laws; and to provide for matters connected therewith. The Department of Water Affairs (DWA) is responsible at a national and provincial level.
The Mountain Catchment Areas Act (No. 63 of 1970)	To provide for the conservation, use, management and control of land situated in mountain catchment areas. The Department of Water Affairs (DWA) is responsible at a national and provincial level.
The Conservation of Agricultural Resources (No. 43 of 1983) (CARA)	To conserve the natural agricultural resources of the Republic by, amongst other things, maintaining the production potential of the land and combating and preventing erosion. Lists Alien Invasive Species The Department of Agriculture, Forestry & Fisheries (DAFF) and the Department of Agriculture, Environmental & Rural Development (DAE&RD) is responsible at a national and provincial level respectively.
The National Forest Act (No. 84 of 1998)	To provide for sustainable forest management and the restructuring of the forestry sector. Lists Protected Species The Department of Agriculture, Forestry & Fisheries (DAFF) and the Department of Agriculture, Environmental & Rural Development (DAE&RD) is responsible at a national and provincial level respectively.
The National Veld and Forest Fire Act (No. 101 of 1998)	To provide for measures to prevent and combat veld, forest, and mountain fires throughout the Republic. The Department of Agriculture, Forestry & Fisheries (DAFF) and the Department of Agriculture, Environmental & Rural Development (DAE&RD) is responsible at a national and provincial level respectively.
National Heritage Resources Act (No. 25 of 1999)	To introduce an integrated and interactive system for the management of national heritage resources. The Department of Arts & Culture (DAC) is responsible

In addition to the National framework, provincial government have also developed legislation. An example for KwaZulu-Natal is provided in Table 4 below.

Table 4: Key KwaZulu-Natal provincial environmental legislation relating to conservation of biodiversity and cultural resources in the Province

ACT	OBJECTIVE / RESPONSIBLE INSTITUTION
KwaZulu-Natal Nature Conservation Management Act (No. 9 of 1997)	To provide institutional structures for nature conservation in KwaZulu-Natal, to establish control and monitoring bodies and mechanisms, and to provide for matters incidental thereto. Ezemvelo KZN Wildlife (EKZNW) is the responsible agency.

KwaZulu-Natal Nature Conservation Management Amendment Act (No. 5 of 1999)	To amend the KwaZulu-Natal Nature Conservation Management Act (No. 9 of 1997) so as to insert certain additional definitions, to amend the definition of 'protected areas', to provide for the appointment of honorary officers, to provide for the conservation of plants and animals, to provide for the control of hunting, to provide for the procedure for the issue and enforcement of permits and to provide for matters incidental thereto. Ezemvelo KZN Wildlife (EKZNW) is the responsible agency.
Nature Conservation Ordinance 15 of 1974	To consolidate the laws relating to nature conservation and to provide for matter incidental thereto. Ezemvelo KZN Wildlife (EKZNW) is the responsible agency.
The KwaZulu-Natal Heritage Act (Act 4 of 2008)	To provide for the establishment of a statutory body to administer heritage conservation on behalf of the provincial government of KwaZulu-Natal, in particular the care for, maintenance, repair and management of historically important sites; architecturally important buildings; public monuments and memorials; military cemeteries and other important graves; traditional burial places; archaeological and palaeontological sites and artefacts; rock art; meteorites; historical shipwrecks, important cultural objects and trade therein, and the traditional building techniques of the people of the Province, by way of providing protections relevant to the type of site or artefact, and its relative significance; integration of protective measures into planning, development and local government systems and by providing for the establishment of educational, training, interpretive and tourism-related projects; and to provide for matters incidental hereto. Amafa / Heritage KwaZulu-Natal is the responsible provincial agency.

3.2 The Institutional Framework

It is the responsibility of the government agencies listed in Table 5 below to administer and regulate the national and provincial legislation shown in Table 3 and Table 4. Two important national research institutions are the Water Research Commission (WRC) and the Agricultural Research Commission (ARC). The two important provincial government departments in KZN are the Department of Agriculture, Environmental Affairs & Rural Development (DAEARD) and Ezemvelo KwaZulu-Natal Wildlife (EKZNW).

Table 5: The institutions which administrate and implement the national and provincial legalisation

INSTITUTION	DESCRIPTION
Department of Water Affairs (DWA)	DWA is the custodian of the water resources of South Africa. It is primarily responsible for formulation and implementation of policy governing this sector. It also has override responsibility for water services provided by local government. While striving to ensure that all South Africans gain access to clean water and safe sanitation, the water sector also promotes effective and efficient water resources management to ensure sustainable economic and social development.
Department of Environmental Affairs (DEA)	DEA is the primary custodian of the environment in South Africa. Its strategic objectives are to protect, conserve and enhance the environment, natural and heritage assets and resources; proactively plan, manage and prevent pollution and environmental degradation to ensure a sustainable and healthy environment; provide leadership on climate change adaptation and mitigation; contribute to sustainable development, livelihood, green and inclusive economic growth through facilitating skills development and employment creation; contribute to a better Africa and a better world by advancing national environmental interests through a global sustainable development agenda.
Department of Agriculture, Forestry & Fisheries (DAFF)	DAFF strives towards a united and prosperous agricultural sector, with the aim of supporting sustainable agricultural development. DAFF's missions is economic growth (and

	development), job creation, rural development, sustainable use of natural resources and food security.
South African National Biodiversity Institute (SANBI)	SANBI is a public entity under the DEA. The Institute works closely with the department in its activities including partnership projects and programmes. SANBI's mandate includes responsibilities relating to the full diversity of South Africa's fauna and flora. SANBI's vision is biodiversity richness benefiting all South Africans. Its mission is to promote the sustainable use, conservation, appreciation and enjoyment of the exceptionally rich biodiversity of South Africa, for the benefit of all people.
Provincial Department of Agriculture, Environmental Affairs (DAEA), KwaZulu-Natal	The lead department for environmental management in the KwaZulu-Natal province is DAEA. It is responsible for exercising and ensuring cooperative governance in line with Section 11 of NEMA. DAFF's vision is optimum agricultural land use, sustainable food security, sound environmental management and comprehensive, integrated rural development. DAFF's mission is together with its partners and communities, champion quality agricultural, environmental and conservation services and drives integrated comprehensive rural development for all the people of KwaZulu-Natal.
Ezemvelo KwaZulu-Natal Wildlife (EKZNW)	Ezemvelo KZN Wildlife is a statutory nature conservation body mandated with the protection of natural resources and management of biodiversity in the province of KwaZulu-Natal (KZN). Its vision is to be a world renowned leader in the field of biodiversity conservation and mission is to ensure the effective conservation and sustainable use of KZN's biodiversity in collaboration with stakeholders for the benefit of present and future generations.
Amafa Heritage KwaZulu-Natal	Amafa is the provincial heritage conservation agency for KwaZulu-Natal and was established as a statutory body in terms of the KZN Heritage Act of 1997. Amafa administers the permit process for the demolition and alteration of protected structures in KZN. It also manages several major heritage projects located in KwaZulu-Natal.
Water Research Commission (WRC)	The WRC is considered to be of national importance in generating new knowledge and promoting South Africa's water research. Since its establishment in 1971, it has contributed to the development of the capacity of the water sector and the broadening of the country's water-centred research and development base. The WRC's mandate includes promoting co-ordination, co-operation and communication in the area of water research and development; establishing water research needs and priorities; stimulating and funding water research according to priority; promoting effective transfer of information and technology; and enhancing knowledge and capacity-building within the water sector.
Agricultural Research Council (ARC)	The Agricultural Research Council is the principal agricultural research institution in South Africa. The primary mandate of the ARC is to promote Agriculture and Industry, to contribute to a better quality of life; and to facilitate and ensure resource conservation. This function is carried out through 11 research institutes. The ARC is also responsible for maintaining national assets and undertaking programmes or rendering services that

The departments are responsible for administering the legislation and regulating its implementation. The legislation also makes provision for the development of instruments and institutions designed to give effect to the principles of these acts. The National Water Act (NWA) serves a good example.

The primary institution provided for in the NWA is Catchment Management Agencies (CMA). It is a requirement that CMAs include effective representation of all user groups and stakeholders within a Water Management Area (WMA), so that in effect the users govern. The Act also recognizes the need for less formal more localised tier of institution that allows stakeholders to engage with the regulator and other users in dealing with localised issues in an integrated manner. Catchment Management Forums (CMFs) fulfil this purpose. Water User Associations (WUA) are another institution that have

legal status under the NWA, and were included to account for groups of users such as farmers within an irrigation scheme, who have a common use and manage the resource as a collective.

In addition to government, there are a significant number of very active NGOS that focus significant resources on conservation. Notable examples in South Africa include the Wildlife and Environment Society of South Africa (WESSA) and the Endangered Wildlife Trust (EWT). In KwaZulu-Natal there are local NGOs such as the Duzi-Umgeni Conservation Trust (DUCT), The Wildlands Conservation Trust (WCT) and the African Conservation Trust (ACT), among many other smaller organisations – all doing notable work as evident in the UThukela Case Study.

3.3 NRM Instruments and Programs

3.3.1 NRM Instruments

In addition to institutions, the legislation also makes provision for the development and implementation of instruments and tools to achieve the aims and objectives of, for example, the National Water Act (NWA).

These range across resource scale from the National Water Resources Strategy (NWRS), to Catchment Management Plans (CMPs). The Act requires that procedures are developed to set and implement the suite of instruments that inform water management. These include (DWAF, 2004):

- Classification Process: the setting of a management class for all water resources.
- Environmental Reserve: establishing the amount of water required to sustain this class (environmental reserve), and
- Resource Quality Objectives (RQOs): the defined objectives with associated numerical targets that need to be met to achieve the management vision as expressed in the class management objectives (RQOs)

The Act requires that stakeholders are involved in the processes developed for each of the above instruments and that all users, biological and human, are accounted for in arriving at the outcomes.

In support of the development and implementation of the mechanisms described above, are well developed technical tools such as hydrological modelling, water quality and biological monitoring programmes. Tools have also been developed to classify resources, delineate their boundaries, and assess their health and value to society. A prime example being the WET-Series[11] which is a set of 11 guideline documents focused on wetland management. These documents cover everything from understanding how a wetland develops, to assessing its health and value to humans, as well as the planning, design, implementation, rehabilitation and monitoring of rehabilitation interventions (WRC, 2007). In addition to these guidelines, there is a national wetland classification system, guidelines on mapping and wetland delineation. There are also wetland forums in most provinces. The governance framework is supported by sound science and technology with ongoing development and research

[11] http://wetlands.sanbi.org/resource.php?id=258

through our Universities and institutions such as the Water Research Commission (WRC), Agricultural Research Commission (ARC) and National Research Foundation (NRF).

3.3.2 NRM Programmes

Table 6 indicates national strategies and programs that are currently being implemented to improve natural resource management in South Africa. The country has been internationally acknowledged for the social and environmental benefits derived from the Natural Resources Management Programme[12] currently managed under the Department of Environmental Affairs (DEA). The Programme has flagshipped the "Working for" Programmes, as well as a range of smaller programmes. Various other Departments have developed similar programmes, for example, the DAFF's LandCare Programme.

Table 6: The strategies and programmes being implemented nationally to improve natural resource management

STRATEGY	DESCRIPTION
The LandCare Programme	The LandCare Programme was adopted by South Africa in 1989 as an innovative approach for promoting sustainable land resource management. It was established to promote productivity through the sustainable use of natural resources, to improve food security and create employment, therefore encouraging South Africans to use sustainable methods of cultivation, livestock grazing and harvesting of natural resources in order to limit land degradation (DAFF 2011). The Directorate Agricultural Land Resource Management of the Department of Agriculture, Fisheries and Forestry (DAFF) administers the LandCare Programme.
Natural Resource Management (NRM) Programme	The Natural Resource Management (NRM) Programme of the Department of Agriculture, Fisheries and Forestry (DAFF) has developed a natural resources atlas to provide access to a comprehensive set of data and a framework for strategic planning at national and provincial levels for the implementation of programmes such as land redistribution, LandCare as well as international conventions focussing on biodiversity, climate change and land assessment for long- term sustainability (DAFF, 2011). This electronic atlas provides access to 63 national spatial layers of information on soil, climate, vegetation, terrain, land capability, as well as high-resolution satellite data (DAFF, 2011). The atlas has been completed providing national level data and is available on http://agris.agric.za (Hein Linderman pers. comm., DAFF, 2011).
The LADA Programme	Land Degradation Assessment in Drylands (LADA) generates up-to-date ecological, social, economic and technical information, including a combination of traditional knowledge and modern science, to guide integrated and cross-sectoral planning and management in drylands (Agricultural Research Council 2010). South Africa is one of six pilot countries where land assessment methodologies were being developed, tested and evaluated. The Department of Environmental Affairs (DEA) endorsed the project and the Department of Agriculture, Forestry and Fisheries (DAFF) is the coordinating institution.
National Water Resource Strategy (NWRS)	The NWRS is the implementation strategy for the National Water Act (NWA) and provides the framework within which the water resources of South Africa will be managed in the future (Department of Water Affairs and Forestry, 2004). This strategy sets out policies, strategies, objectives, plans, guidelines, procedures and institutional arrangements for the protection, use, development, conservation, management and control of the country's water resources (DWAF, 2004).
Catchment Management Strategies (CMS)	The delegation of water resource management from central government to catchment level is being achieved by the establishment of Catchment Management Agencies (CMAs). Each CMA has to develop a Catchment Management Strategy (CMS) for the protection, use, development, conservation, management and control of water resources within its Water Management Area (WMA) (DWAF, 2004). A CMS is a statutory document which provides the vision, and the strategic actions to address integrated water resources management (DWAF, 2004). The framework for

[12] https://www.environment.gov.za/projectsprogrammes

	the CMS is given by the National Water Resources Strategy (NWRS) and the CMA must seek co-operation and agreement from stakeholders and interested persons when developing the CMS. Until such time that CMAs are established and fully operational, the Regional Offices (ROs) of the DWA will manage the water resources in their areas of jurisdiction (DWAF, 2004).
Working for Water (WfW)	The WfW programme is a government-funded, multi-partner organisation focused on eradicating invasive alien plants. It considered one of the most successful programmes on the continent and receives on-going political support as it provides jobs to local communities and fights against poverty. The programme is administered through the Department of Water Affairs (DWA).
Working on Fire (WoF)	Working on Fire is a government-funded, multi-partner organisation focused on Integrated Fire Management and veld and wild firefighting (Working on Fire 2011). WoF is considered as one of the most effective poverty relief and skills development programmes in South Africa. It trains and employs people from local communities to fight veld fires. The funding for WoF is channeled from the Department of Water Affairs through the Working for Water programme.
Working for Wetlands (WfWet)	The Working for Wetlands Programme is a government-funded, multi-partner organisation focused on rehabilitating damaged or degraded wetlands. Working for Wetlands uses wetland rehabilitation as a vehicle for both poverty alleviation and the wise use of wetlands (Working for Wetlands, 2011). The programme is implemented by the South African National Biodiversity Institute (SANBI) on behalf of the Departments of Environmental Affairs (DEA); DAFF and Water Affairs (DWA).
Comprehensive Rural Development Programme (CRDP)	The CRDP is aimed at being an effective response against poverty and food insecurity by maximizing the use and management of natural resources to create vibrant, equitable and sustainable rural communities (DRDLR, 2009). The vision of the CRDP includes: contributing to the redistribution of 30% of the country's agricultural land; improving food security of the rural poor; creation of business opportunities, de-congesting and rehabilitation of over-crowded former homeland areas; and expanding opportunities for women, youth, people with disabilities and older persons who stay in rural areas. (DRDLR, 2009). The National Department of Rural Development and Land Reform is coordinating the programme.
The Biodiversity Stewardship South Africa (BSSA) Programme	The Biodiversity Stewardship South Africa (BSSA) Programme is an initiative of the National Department of Environmental Affairs (DEA) in partnership with key conservation organisations. Biodiversity stewardship recognises landowners/users as custodians of their land, including the biodiversity and natural resources (Biodiversity Stewardship SA 2009). It is a mechanism that promotes and supports the wise use and management of natural resources and biodiversity, and the ecosystem services they provide, through the form of voluntary legal agreements with private and communal landowners/users (Biodiversity Stewardship SA 2009).
National Protected Areas Expansion Strategy (NPAES)	The NPAES serves as a national framework for an integrated, coordinated and uniform approach to the expansion and consolidation of the National Protected Area System (DEAT 2007). NPAES was commissioned by Department of Environmental Affairs and Tourism, coordinated by SANBI, and drafted in close collaboration with SANParks, other national conservation agencies and Provincial conservation agencies, such as Ezemvelo KZN Wildlife (DEAT 2007).
The National Grassland Programme (NGP)	The National Grasslands Programme is a national initiative under the Department of Environmental Affairs (DEA). The National Grasslands Programme and its partners aim to protect and conserve the rich biodiversity and ecosystem services of the grasslands biome. The South African Biodiversity Institute (SANBI) is the responsible agency that is pursuing a 20 year conservation strategy of the grasslands biome.
Enkangala Grassland Programme	The Enkangala Grasslands Programme is a World Wildlife Fund (WWF), South Africa, project, and was established to develop innovative ways of using the land more sustainably without causing further damage (WWF 2011). WWF is developing innovative mechanisms to secure the biodiversity and relevant ecosystems good and services of the grasslands. The project team is working closely with key stakeholders in the area, including commercial farmers, emerging farmers, land reform projects and business to get the necessary buy-in and ensure that their activities are supported and approved by key land users (WWF 2011).

Figure 8 below provides a visual representation of national and provincial Acts and their responsible institution/s of the Table 3, Table 4,Table 5 and
Table 6.

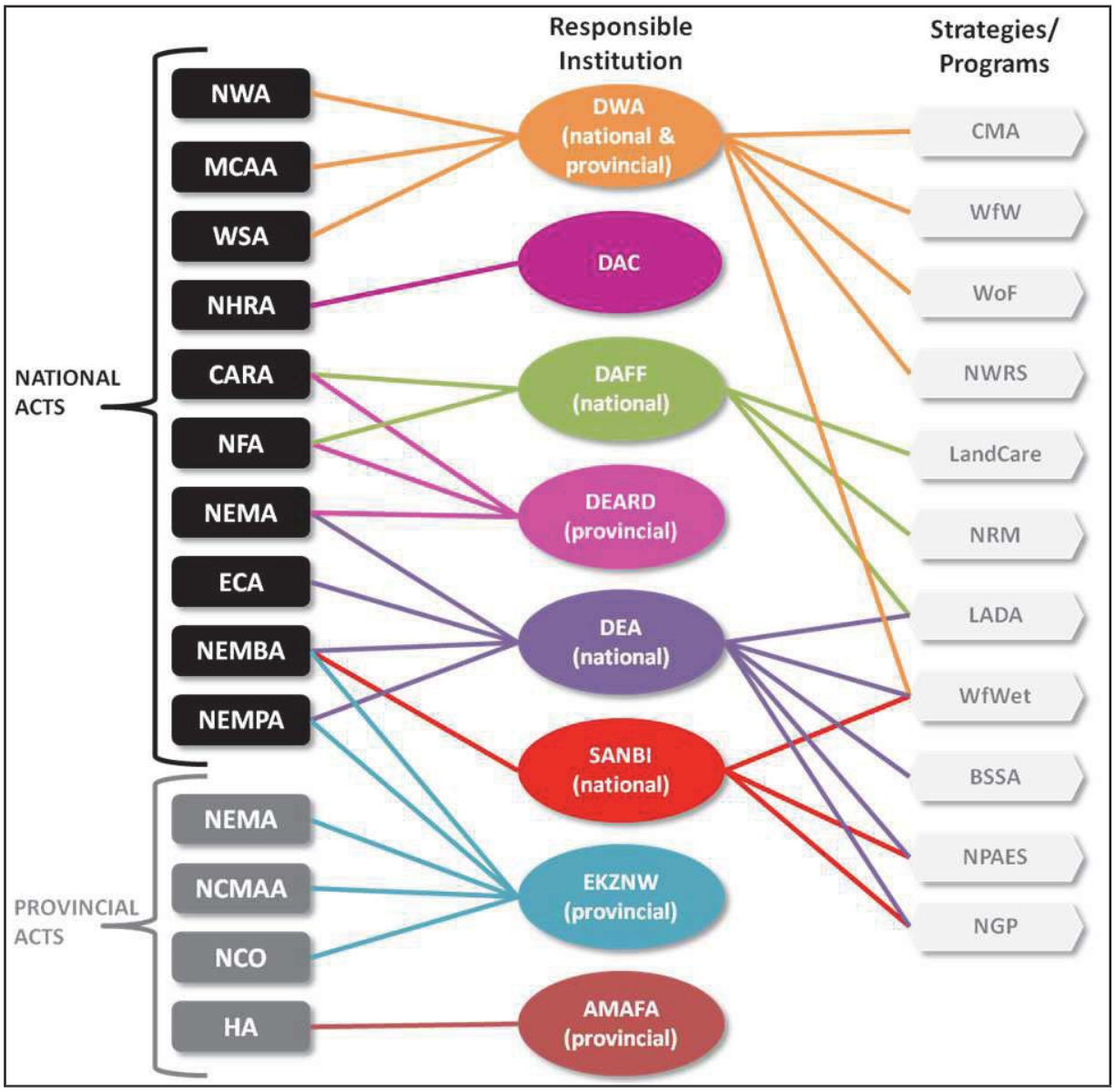


Figure 8: Governance structure indicating national and provincial Acts and their responsible institution as well as the strategies or programs that they govern

The following section reflects on indicators in determining whether this framework is having the desired effect.

3.4 The Status Quo – An Unsustainable Future?

As described above, the natural resources governance framework would appear to be well developed with all the elements in place through each level of the hierarchy – starting with policy and legislation right through to the institutions, scientific tools, supporting research institutions and NGOs. This section reflects on whether the NRM Governance structure is proving effective by considering the findings of environmental reporting at a various scales. Environmental reporting has developed over the past 20 years and provides an understanding of the state of our natural resources and trends across scale, i.e. global[13], regional, national and local scale (SADC, 2008; DEAT, 2006).

Globally the Millennium Ecosystem Assessment (MEA) summarized the findings of the assessment in 10 key messages, of which the following are particularly relevant to natural resource management:

- The loss of services derived from ecosystems is a significant barrier to the achievement of the Millennium Development Goals to reduce poverty, hunger, and disease.
- Measures to conserve natural resources are more likely to succeed if local communities are given ownership of them, share the benefits, and are involved in decisions.
- Better protection of natural assets will require coordinated efforts across all sections of governments, businesses, and international institutions.

These messages emphasize the links between the state of natural resources and human well-being, the need for greater involvement and authority for local role-players in decision making and increased coordination across all roleplayers.

In South Africa, the 2006 South Africa Environmental Outlook (SAEO) reported that at the time, there were 19 sub-national State of Environment Reports produced during the report period 1999 to 2006. Since then, there have been three Provincial reports, seventeen State of Rivers reports[14], a State of the Coast Report (2006), State of the Forests report (2007-2009) and several municipal State of Environment Reports, as well as a range of local scale sectoral reports. The National Spatial Biodiversity Assessment provides an important reference regarding trends in the state of biodiversity across terrestrial, aquatic and marine systems in South Africa (Driver et al., 2005). The findings of these reports do not make for good reading.

Nationally, the 2006 SAEO document acknowledged that the "comprehensive and generally sound environmental regulatory regime centred is in place" and that "there has been a steady increase in the budget allocation for environmental management at both the national and provincial levels". The report also concluded that, despite the improved framework and allocation of capacity:

- All major ecosystems are threatened in one way or another, whether through direct threats or because of weaknesses in the overall structure of their environmental management systems.

[13] Millennium Ecosystem, Assessment. 2005. Ecosystems and Human Well-Being: Synthesis. World Resource Institute.
[14] http://www.dwaf.gov.za/iwqs/rhp/state_of_rivers.html

- The transformation and degradation of natural areas and resources continues, as does the fragmentation of protected or undisturbed areas. This results in the loss of biodiversity and concomitant ecosystem services, which is likely our most serious environmental problem.

In terms of biodiversity, the National Spatial Biodiversity Assessment (NSBA) reported that (Biodiversity GIS, 2007):

- For terrestrial systems, 34% of all 440 ecosystems are threatened and recommended that responses include, among other things, "Improved involvement of the production sectors responsible for the use of resources".
- The situation for rivers is worse than the terrestrial situation with 82% of the main river signatures classified as threatened, of which 44% are critically endangered. The report highlighted the fact that:
    - Quality , quantity and sustainability of water resources are fully dependant on good land management practices within catchments, so that
    - "The fate of our countries water resources relies on an integrated approach to managing water and land".

When reviewing our responses, the 2006 SAEO highlighted improved capacity and development of institutional structures such as SANBI. The negatives highlighted were:

i. Development planning in general did not adequately incorporate environmental sustainability.
ii. There was still no concerted effort to redirect our patterns of production and consumption in a sustainable direction.
iii. The myriad of environmental responsibilities placed on Provinces and Local Authorities without addressing capacity constraints was leading to confusion and despair.

The above discussion indicates that despite the developments in the environmental governance framework, the state and trends of natural resources remain negative, continuing on the path of an unsustainable future. It also suggests that the failure of the framework to halt and reverse the situation is due to:

- A failure to take a holistic approach that considers all resources in planning and management.
- A lack of understanding and acknowledgement of the value of natural resources in development planning.
- Poor coordination of the role-players and various other elements that make up the environmental governance framework.
- Increased delegation of responsibility for environmental management to the local level, without the necessary capacity and support to act on these responsibilities.

3.5 Plotting a Way Forward

3.5.1 Increased Focus on NRM

As previously indicated, Government has invested in the rehabilitation and maintenance of resources through the various NRM Programmes. More recently, government has developed a number of Strategic Integrated Projects (SIPs), which form part of the National Economic Development Plan and have specific infrastructure programmes and components. This plan was adopted with the aim of transforming the current economic status in South Africa, through job creation, service provision and backing of the integration of African economies. The Presidential Infrastructure Coordinating Commission (PICC) was established to identify existing infrastructure gaps and plan accordingly through the SIPs (SANBI, 2014). This was conducted through an analysis of predicted economic and population growth as well as existing service provision shortages (water, roads, electricity, sanitation, etc.).

From this process, a new SIP has been developed which is led by the DEA and referred to as 'SIP 19, Ecological Infrastructure for Water Security'. SIP 19 aims to improve water resources and other environmental goods and services in South Africa through the protection, conservation, rehabilitation and maintenance of important ecological infrastructure. This demonstrates efforts made by government to integrate ecology in the governance framework to ensure the sustainability of ecological infrastructure in development planning (SANBI, 2014).

SIP 19 is therefore based on securing ecological infrastructure that provides essential ecosystem good and services, on which the country depends. Such infrastructure includes:

- Ecosystem services: cultural, provisioning, regulating and supporting services
- Watershed services: water quality and supply, flow regulations and aquatic productivity

The motivation is that the destruction and change (due to global warming) of this infrastructure will threaten their sustainability and therefore their ability to provide the relevant services. In order to ensure the sustainability of such ecological infrastructure, management and protection of these resources is vital in meeting demands. The implementation of SIP 19 will add significantly to the current NRM efforts.

3.5.2 The Need for an Integrated Future

In view of the discussion to date and findings of most reporting, it is suggested that we need to be wary of increasing NRM effort if it is not done so constructively. The status quo suggests that despite the explicit requirement for integrated planning and decision making, and for stakeholder involvement within the governance framework, our current efforts at integration are falling short. We need to analyse the failings of the status quo in more detail in order that we address current shortcomings and spend resources on NRM wisely going forward.

The report discussed above highlights the need for integrated management frameworks that emphasize the reliance of people on natural systems and strengthens the capacity and involvement of local role-

players in decision making. A new approach can however range from a total overhaul of the governance framework to simply introducing new ways to achieve integration within the existing structure. Identifying the point along this continuum at which we should peg any new ideas is informed by a review of what is currently wrong, as well as highlighting the key entry points at which positive change can best be effected. The remainder of this report is focussed on this analysis. The experience in the Afromaison project's UThukela Case Study is analysed to identify the key issues that limit effective integration in NRM.

4. CHALLENGES TO INTEGRATION

The following issues have been identified as presenting a barrier to or a challenge for integrating management of Natural Resources. They were identified through analysis undertaken in the Afromaison project in relation to the Uthukela District context.

4.1 A Limited Definition and Understanding of the Value of Natural Systems

There a various definitions for natural resources. PEGASYS (2013) present what are considered the commonly used economic and environmental definitions of natural resources (Error! Reference source not found.).

Table 7 Economic and environmental definitions of natural resources

Natural Resources include minerals, forests and biota, water, fertile land, air that occur in nature and can be used for economic gain. A material source of wealth, such as timber, fresh water, or a mineral deposit, that occurs in a natural state and has economic value.	Economic definition
Natural resources occur naturally within environments that exist relatively undisturbed by mankind. A natural resource is often characterised by amounts of biodiversity and geodiversity existent in various ecosystems.	Environmental Definition

The economic definition recognizes the value to be obtained from the extractive use of natural resources such as mining and forestry or the use of water for irrigation or in industrial processes. Such activities constitute a direct use of a resource for economic growth. Due to the extensive nature of sectors like mining and agriculture, they do however result in the large scale transformation and fragmentation of natural systems. Certain sectors also reduce environmental quality through the pollution. The mining sector has probably one of the worst environmental legacies across extractive sectors, with acid mine drainage being a prime example of the failure to manage the cumulative negative impacts over time. So while there is a financial or economic benefit, it comes with an associated cost.

In the case of the environmental definition presented in Error! Reference source not found., it recognizes the diversity that occurs in undisturbed systems. This includes habitats, the associated species and ecological processes. As a signatory to the Convention on Biological Diversity (CBD) South Africa has developed policy and legislation to give effect to the responsibilities inferred on signatories. The NEMA: Protected Areas Act (NEM:PAA) provides for the establishment and management of a network of protected areas. The National Environmental Management: Biodiversity Act (NEMBA), is another key act that governs the use of natural resources with biodiversity conservation as the purpose.

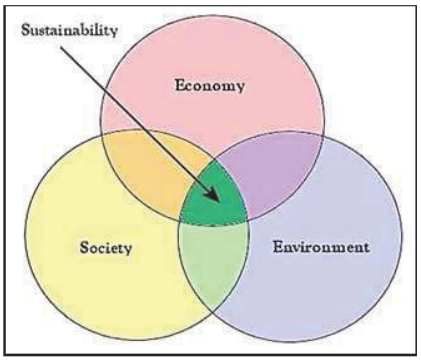


Figure 9:The 'original' sustainability model

The conservation value of systems and species has been established and mapped at a national scale and provincially using the Conservation Planning methodology (Margules and Pressey, 2000). Ezemvelo KZN Wildlife has refined the provincial scale information in compiling Biodiversity Sector Plans (BSPs) at the District Municipal scale.

The Uthukela District BSP (Kanz et al., 2009), was one of the first compiled, with the final outcome being a map Figure 10. It shows priority areas for biodiversity conservation in the District for which land-use guidelines and strategies for managing these priority areas are provided. The intention is that this sector plan feeds into the Municipal planning tools such as the spatial development framework (SDF).

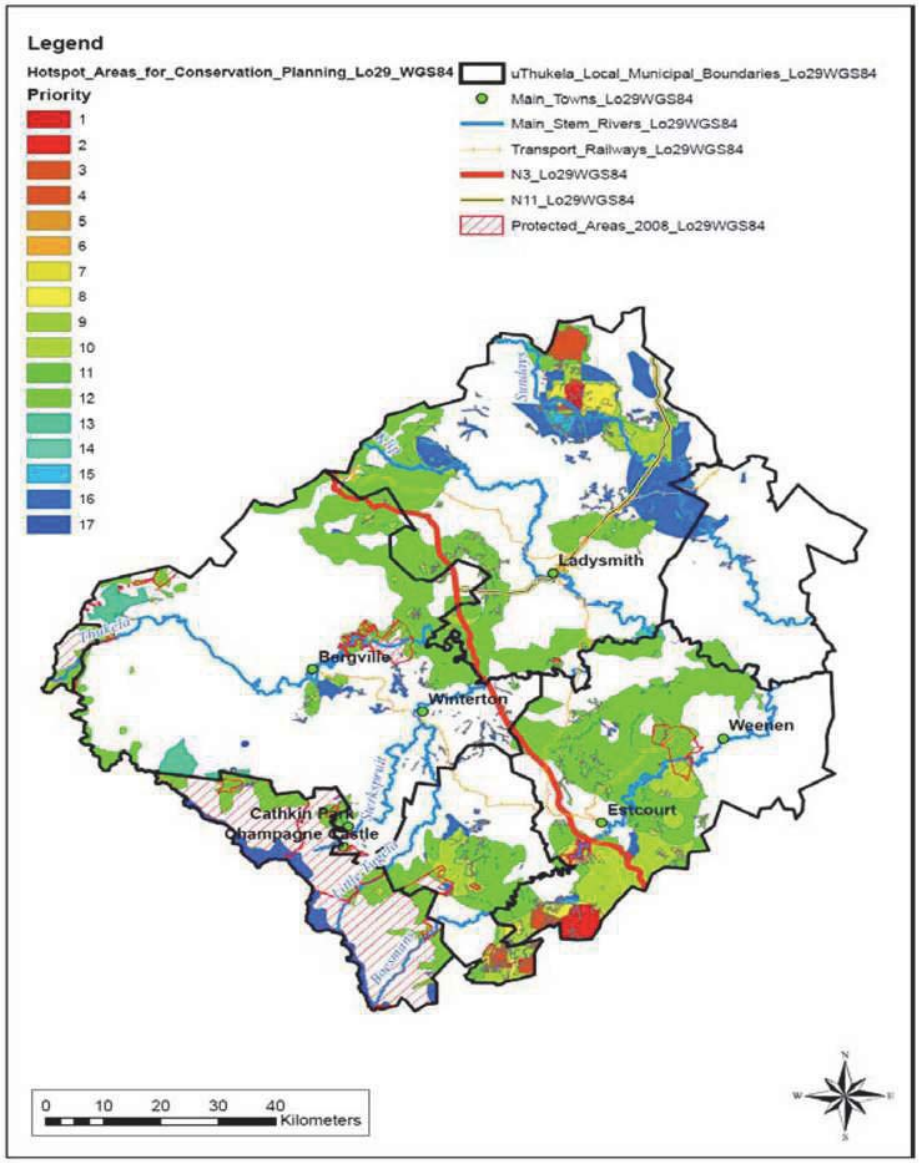


Figure 10: Priority areas for biodiversity conservation and management in the Uthukela District (Kanz et al., 2009)

The need to assess the negative impact of extractive activities such as AMD through the EIA processes coupled with the protection offered by legislation and policy should technically ensure the conservation of important biodiversity and ecosystems is secured. Masakong Management (2008) however concluded that EIA is not suited to the assessment of cumulative or secondary/long term impacts such as AMD. They also reported that cumulative assessment was poorly done in the EIAs they analysed as part of a national review into the effectiveness of EIA. Furthermore, where a development site does not harbour high value biodiversity the relevant legislation will not carry weight. As indicated in Figure 10, large areas of the Uthukela District were not identified as having high conservation value. The reality in South Africa is that as a developmental state, the economic growth value is frequently given greater importance in decision making. This is also because it is easier to quantify than biodiversity value. More than 95% of all EIAs are authorized. This translates to a failure of the sustainability model shown in Figure 10, because equal consideration is not allocated to all three elements.

In recognition of this shortcoming, South Africa has adopted the sustainability model shown in Figure 11. This revised model recognises that economic prosperity and social well-being are dependent on environmental quality.

The concept of ecosystem services has emerged as the mechanism best suited to reflect the 'additional' or previously 'unaccounted for' value of natural resources and thereby integrate natural systems, people and the economy. There are four types of ecosystem services defined below according to TEEB (2010). The relationship between these different services and human wellbeing is depicted in Figure 1212.

- Provisioning services – are the materials that ecosystems provide such as food, water and raw materials.
- Regulating services – are the services that ecosystems provide by acting as regulators. This includes regulation of air and soil quality, as well as flood and disease control.
- Habitat or supporting services – underpin almost all other services. Ecosystems provide living spaces for plants and animals – and maintain their diversity.
- Cultural services – are the non-material benefits of ecosystems – from recreation to spiritual inspiration to mental health.

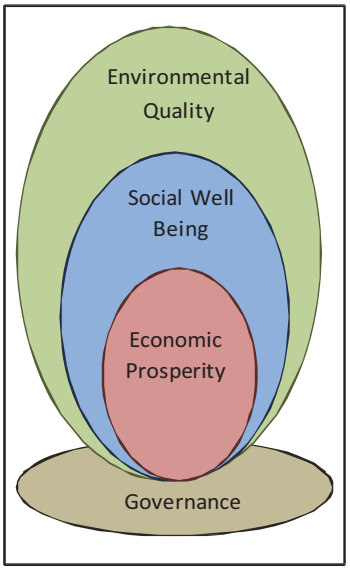


Figure 11: Sustainability model in South Africa

The concept reduces the complexity of natural systems to a manageable (comprehendible) number of services that people get from ecosystems as a way to focus on human dependence on the environment and to engage stakeholders and the community in dialogue about what services are needed where, when and by whom (Cork et al., 2007).

- The concept is part of society's response to ecologically sustainable development – not an alternative.

- It provides a meaningful way of community members and stakeholders contributing transparently to land use planning.
- It is a way of framing and communicating planning and policy issues.

The following example illustrates how the inclusion of ecosystem services alters decision making about resource use. Additional dams are proposed as the second phase to the Thukela Vaal transfer scheme. Given the strategic importance of the Gauteng province in terms of economic activity compared with the Uthukela Catchment, it would appear a logical decision to transfer additional water to the Vaal system. However this first cut decision is only considering the value of the water in terms of economic growth (the extractive value). One needs to factor into the decision that:

- The Uthukela is a sediment rich system and that the supply of sediment is essential for maintaining the productivity of the prawn banks offshore of the Thukela mouth, which sustains a prawn fishery.
- The sediment supply to beaches will be severely reduced as it will be trapped in large impoundments (adding to the existing impact of numerous large dams within the system). This has the potential to reduce the storm protection service provided by the beach environment. A reduction in this service will increase risk of damage to coastal infrastructure.
- The increased development in the Vaal system may include heavy industry and mining which will reduce water quality in that system which is already highly stressed, i.e. the dilution capacity or service provided by the river systems has been exceeded. This will increase water treatment costs. A reduction in the value of agricultural production from the catchment may result from reduced irrigation.

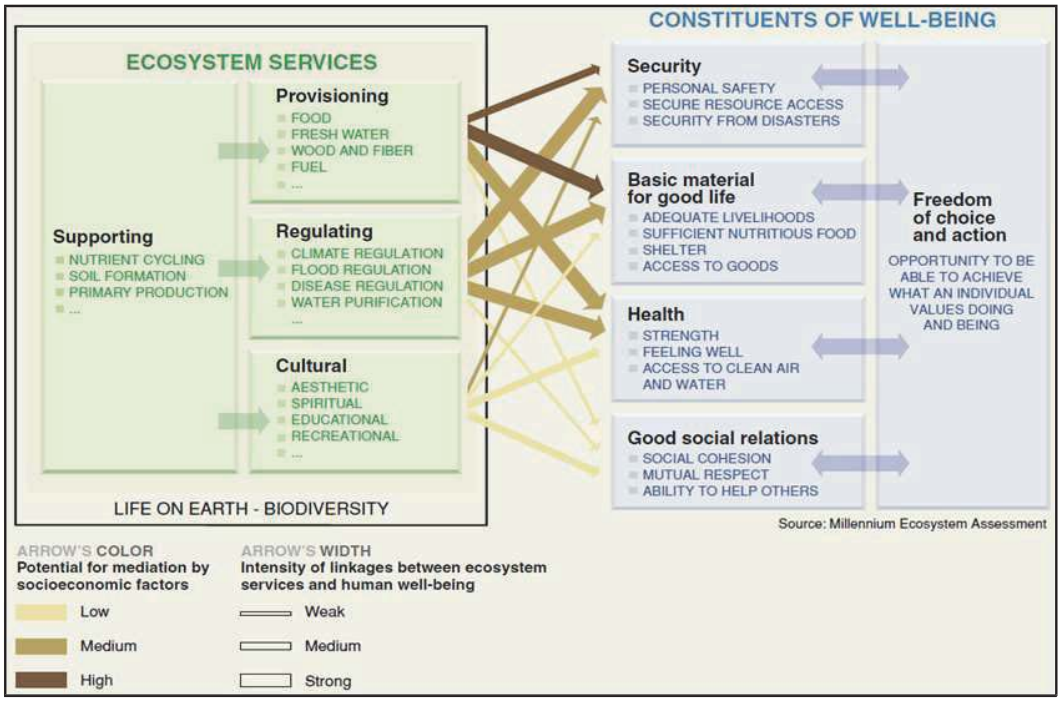


Figure 12: Types of ecosystem services and their contribution to human well being

The example is broad, but illustrates what are real issues. It shows how the simple definition in Table 1, that considers only the extractive and biodiversity value, fails to account for the full value of retaining the water and sediment in the Uthukela system. While the decision may still be that more water is transferred from the Uthukela to the Vaal System in future, the amount may be reduced once the full value and impacts have been factored in to the decision, i.e. a sustainable volume. The point is that, unless ecosystem services are included in the definition of natural resources their full value will not be accounted for in decision making, which limit our ability to move towards environmentally sustainable economic growth.

As concluded in the South African Environmental Outlook (DEAT, 2006) "Development planning in general did not adequately incorporate environmental sustainability", and the "myriad of environmental responsibilities placed on Provinces and Local Authorities without addressing capacity constraints was leading to confusion and despair". Development planning is the mandate of Local Government. Inclusion of ES's in LG planning instruments would assist in addressing both of these issues because it would ensure that environmental sustainability is integrated at a strategic level of decision making – rather than grappling with this challenge at the level of specific development applications.

Summary Statement: The definition and understanding of natural systems needs to explicitly account for the ecosystem services they generate and the value of these services in supporting social well-being and economic prosperity, i.e. we need to better integrate natural, social and economic systems.

4.2 Effective Institutional Coordination

Poor institutional co-ordination was identified as probably the most significant barrier to effective management by the large majority of role-players consulted during the Afromaison project. A number of issues and challenges were identified with regards to achieving coordination. These are discussed below.

4.2.1 Integrating Across Scale and Boundaries

The following diagram (Figure 13) broadly summarizes the institutional framework for INRM in the Uthukela District. It shows the diversity and number of government and other role-players across the national, provincial and local scales that influence NRM.

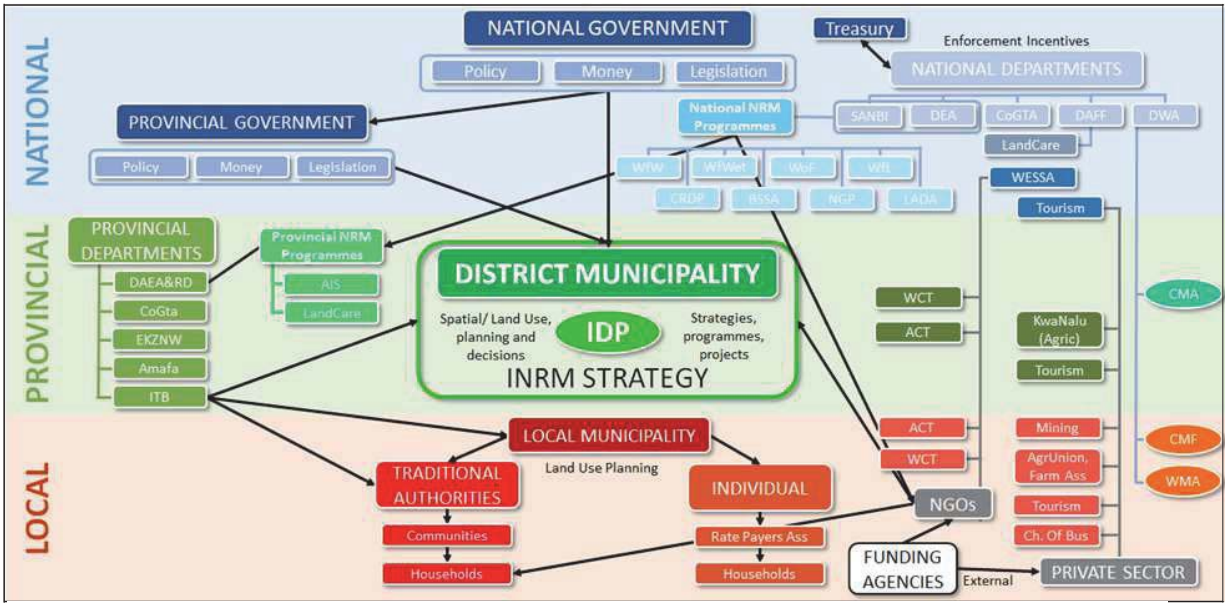


Figure 13:Summary of the roleplayers and relationships within the INRM Institutional framework

Vertical Integration

A common NRM challenge is achieving vertical integration across the hierarchy of governance scales, from national government to provincial, local and even community or household level. Effective vertical integration requires that the national policies and legislation are translated into provincial policy and in turn into municipal instruments such as spatial plans or bylaws. The provincial section of the Working for Water (WfW) programme explained that their planning was based on guidelines from National. WfW prioritize areas based on a number of criteria, with watershed services being a key criterion. Biodiversity and poverty nodes are also important selection criteria. Data from DWA (flow rates, demand, ground water, ecological reserve), social (poverty nodes in the - DMs), biodiversity (EKZNW) is used with different weightings to finalise priority areas. The Invasive Alien Species Programme ASP is a programme within the Provincial Department of Agriculture and Environmental Affairs (DAEA – Agriculture Directorate) that like WfW is involved in the eradication of alien invasive plant and tree species. The AISP has developed their own multi-criteria decision system to prioritise areas and resources are allocated accordingly. A strategy for the province has been developed using the Geographic approach. This is an example of a national programme (operating provincially) and provincial programme with similar activities and objectives both undertaking planning with slightly different criteria. This represents duplicated effort.

There are examples of conflict between local and national priorities for resources as illustrated by the following example. A farmer in the catchment of Woodstock Dam reported that he had been refused a license to build new dams because the water was allocated for transfer to the Vaal system – a national priority. Vertical integration is a two way relationship. Local demands for resource need to be fed ‘upwards’ so that they are factored into decisions regarding resource allocation. This example also highlights the interdependencies between resources and the challenges of coordinating priorities across

resources and scale. The area in which this farm is located has been delineated as very high agricultural potential by the provincial department of Agriculture (Collett and Mitchell, 2012). The policy for such areas is that the agricultural potential is optimized. This policy objective would be achieved if additional irrigation is made available, but the national imperative for the transfer of water to the Vaal system conflicts with the provincial agricultural policy.

The Working for Water Programme (effectively at a provincial scale) reported that they receive policy (guidelines) and budget from National but do not engage local government in deciding where and how to spend the budget (Brundvig, pers comm). They indicated a wish to work more closely with Municipalities in planning and implementing their operations to make their impact more relevant to the local needs Brundvig (pers comm). The provincial AISP that like WfW they do not work closely or through the municipalities.

Horizontal Integration

It is evident from the overview of the Uthukela District that there is a significant focus on Resource Management in the Northern sections of the Okhahlamba Local Municipality – particularly in the Amazizi and Amangwane Traditional Authority areas. The range of roleplayers working here includes:

- University of KwaZulu-Natal (School of Bioresources Engineering and Hydrology, Farmers Support Group (Part of Centre for Environment, Development and Agriculture),
- NGOS (Wilderness Action Group, ACT and Wildlands Trust),
- Government NRM Programmes (National WfW, Provincial LandCare and the provincial AIS Programmes).

The work cuts across research and includes a large focus on rehabilitation interventions. The Wilderness Action Group, explained there is a level of confusion amongst the communities as to who is doing what and why, and that proper coordination is required. The African Conservation Trust had attempted to coordinate actions at this local scale but there was not anything at the provincial scale.

The implication of limited horizontal coordination is illustrated by the following example. A lack of communication across these programmes doing similar activities (donga rehabilitation, etc.) led to higher rates being paid than for permanent farm work. This resulted in certain labourers leaving permanent positions for the temporary rehabilitation work. Based on the higher income these labourers entered into Hire Purchase (HP) agreements which they could no longer service when the temporary work ended. This scenario is an example of poor horizontal coordination, particularly as it is directly counter to one of the proposed benefits of these programmes, i.e. job creation and financial benefits.

Another challenge in terms of horizontal coordination across the same scale is ensuring widespread adoption of suitable interventions (scaling out) across broader areas. While the upper Thukela region warrants the attention it has received due to the level of degradation and proximity to the WHS and the high levels of poverty, there are other degraded areas across the same altitudinal zone and in other regions of the District that have not received attention. Another factor for the concentration of activity

in this region is that the local communities have been sensitized to the concept of NRM, and have developed a range of skills and institutional structures which make it easier for external actors to work here. Another example of "ease of access to areas" being a limitation in terms of resource management is in the case of the Working for Wetlands programme. Landowner willingness to allow rehabilitation to take place on their property has been a primary condition for the programme selecting sites, despite other wetlands considered more important from a biodiversity or functional point of view occurring in the same catchment Goge (pers comm)[15].

Integration across Boundaries

The challenge of vertical and horizontal integration is complicated by the fact that administrative boundaries do not align with boundaries of natural systems. The Uthukela River catchment is located wholly in KwaZulu-Natal but traverses three district and approximately 12 Local municipalities on its route to the Indian Ocean. Furthermore water is transferred through the Free-State Province to Gauteng and the Vaal system (Figure 14). This raises the question of whether to integrate management according to administrative boundaries such as a province, or a natural system, such as a river catchment. An additional consideration, particularly for rivers, is that due to their linear nature decisions in one area of a system affect the quality and quantity of water downstream.

Figure 14:Overview of the Uthukela Catchment and its sub catchments

[15] Mbali Goge SANBI – Working for Wetlands: KZN Regional Manager

Integration across Resources

In addition to administrative and natural boundaries not aligning, natural systems and priorities don't necessarily coincide. The Natural Resources section of the KwaZulu-Natal Department of Agriculture and Environment has delineated the province in terms of the agricultural potential of land (Collett and Mitchell, 20102). The associated provincial policy is that areas of high and very high potential should be secured for agricultural use and that production on such areas should be optimized. There is a broad band of high agricultural potential land that cuts across several catchments. Overlapping these are areas identified as necessary to conserve to meet biodiversity targets in terms of the Provincial Biodiversity Conservation Plan. The challenge is consequently to establish a common understanding across managers of different resources (water, land, biodiversity) of the priority areas for these resources and where there is synergy or conflict between the associated management objectives or policy imperatives. This issue was summed up by Pfotenhauer (pers comm) who noted that "although water is a unifying/common element, but there's land, wildlife management entities as well, and their acts are not coordinated".

4.2.2 Capacity Constraints – Failure of Institutional Capacity to keep pace with Legal Reform

South Africa is lauded for having some of the most progressive environmental legislation in the world, with the National Water Act (NWA) being a prime example. The NWA is just one of the many acts that was promulgated to give effect to the environmental rights enshrined in the Constitution. It is however also widely acknowledged that implementation of this legal framework has been poor. It is suggested here, that one of the reasons for this is the sheer 'weight' of the legal framework that has arisen from the legal reform process that has taken pace since 1994. This is evident when one considers the Compendium of Environmental Law (Van der Linde, 2006). The introduction to the compendium acknowledges that while important legislation has been enacted at a national, provincial and local level, only the most important national legislation has been listed in the compendium. And yet the document is still over 500 pages long, and covers 67 different Acts including everything from water quality to air pollution, noise pollution and waste management, land, agriculture and biodiversity protection and management across all ecosystem types (Van der Linde, 2006). Each of the categories includes between four and ten specific Acts. It must also be noted that this is a 2006 document, and that the legislative reform process has continued with subsequent new Acts and regular updates in terms of regulations promulgated to give effect and detail to the primary legislation.

The development of capacity to implement legislation would not appear to have kept pace with that of the legal reform. The government departments are weighed down with the job of implementing the specific Acts. As evidence of this, it has taken almost 15 years from the date of promulgation to finalise the procedures for classifying water resources and setting resource quality objectives. Further evidence relating to the regulatory aspect is the significant backlog in the issuing of water use licenses, which currently take upwards of a year to be granted. Almost all government officials interviewed during the project reported capacity issues in terms of unfilled positions, high staff turn-over and inadequately trained staff. The following extracts support this finding:

- Buthelezi (pers. comm.) reported that "despite having a compliance and enforcement unit in the department it is not effective. They lack capacity to monitor all the farmers and how much water is being extracted. WUAs should be doing this but they are not functional. There is a lack of capacity to monitor and enforce." The lack of capacity to monitor and enforce relates to the two issues discussed above.
- Viljoen[16] (pers. comm.) reported that at times he effectively takes responsibility for half a dozen positions due them being vacant, and that the same situation applies in the posts in the levels below him. This significantly affects the ability to integrate the various sector plans required to form part of the IDP.
- In the case of Agriculture, according to Wood[17] (pers. comm.) "Conservation Committees played an incredibly important role in the past, today there are no active Conservation Committees in the district and the only active Committees in the Province are those which have merged with the Environmental Committees in the sugar industry in the sugar production areas. There were 34 Conservation Committees in the Province at one stage including 5 in uThukela District". The capacity to support NRM on the ground has therefore diminished.

These capacity constraints extend to the Water Services section within the District Municipality which is the Water Services Authority, where Coetzee [18](pers. comm.) explained that they have one unit (staff of 4) who are responsible for maintaining over 4000 boreholes. They also lack a dedicated vehicle and workshop facilities. The constraints are most significant in terms of sanitation where the major Waste Water Treatment Plants (WWTP) are constantly performing well below required standard due to inadequate funding and technical skills to upgrade and maintain them. The Uthukela District was the worst performing Water Services Authority in the Province according to Blue Drop and Green Drop reporting system. This has direct and negative consequences for the resource in terms of pollution.

The Manager[19] of the Uthukela District office of the provincial Department of Agriculture and Environmental Affairs reported that municipalities:

- "Lack capacity and understanding of environmental management – and there are no environmental management units in any of the municipalities within the study area.
- Insufficient funding to address natural resource management.
- Lack of commitment from politicians to environmental issues".

A secondary impact of the 'overwhelming requirements of the legal requirements' is that, officials are so immersed in coping with the requirements of the Acts they are responsible for administering and against which their performance is measured, that representatives reported having little time to engaging other stakeholders in dealing with issues of common interest. It is evident that they are unable to dedicate time and resources to the integration required by many Acts, specifically the

[16] Wynand Viljoen (Planning Manager, Uthukela District Municipality)
17 Harland Wood (DAEA&RD)
[18] Cindy Coetzee (Water and Sanitation Services Manager, Uthukela District Municipality)
[19] Todi Netshitangani (KZN DAEA – Uthukela District Office);

framework legislation like NEMA, which is focussed on co-ordinated management and decision making with regards environmental issues.

In summary, it would appear that the development of capacity in terms of people (filling positions), budget and technical skills has not kept pace with the development of the legal framework. This is exacerbated by high staff turnover. This hampers the level of integration possible.

4.2.3 Failure of Institutional Reform to Keep Track with Legal Reform

In a similar vein as the previous issue, institutional reform is playing catch up with the legal reform process. In line with the title of this project it is useful to consider the Water Act, which was one of the first significant 'environmental' Acts promulgated post 1994. The primary institutional structures provided for in the NWA are Catchment Management Agencies (CMAs). Fifteen years on from the promulgation of the Act, and following significant investigation and development of CMA models at the scale of Water Management Areas (WMAs), only a few CMAs have been established. Following a lengthy review of the alignment with the 19 WMAs, DWA are in the process of restructuring CMAs from 19 Water Management Areas to 9 – almost in line with the original provincial alignment.

The lack of key management institutions is evidenced by the following extract from an interview with a DWA official[20] working in the uThukela Catchment. "In late 2008 the Thukela Water User Board (WUA) was formally established. Four irrigation boards were transformed into the WUA. To date this has only been on paper because the WUA is not functional. A Management Committee and business plan is needed for the CMA. A service provider was sought to assist but procurement issues arose and the process is now on hold. Specialized people are required to develop the business plan which DWA cannot provide. This is one of major challenges in the province".

There are three Catchment Management Forums (CMFs) in the UThukela District (DWAF, 2001), but stakeholders reported that they are ineffective because they have no legal standing and the associated inability to reach decisions that will address the resource management issues. Stakeholders reported that CMF meetings are consequently not well attended, despite DWA providing funds for attendance[21].

The lack of these fundamental institutions designed to integrate stakeholder involvement in resource management is a significant gap and undermines the ability to integrate user demands at a local and catchment scale with higher level planning and resource allocation.

The lack of CMAs and the limitations of CMFs are exacerbated by the recent decision by the Minister to do away with Water User Associations (WUAs), which are often relatively well capacitated institutions who played an important role in representing and managing their members in a co-ordinated way.

[20] Mxolisi Buthelezi (Senior Development expert for the area), Directorate of Institutional Establishment (DWA)
[21] Proceedings of Afromaison Stakeholder Workshop, 18-19 September 2014. Institute of Natural Resources

4.2.4 Communication

Communication is an important element of achieving integration in NRM as the exchange of information is critical in managing and understanding complex natural systems. It is not only important for decision making and planning but also for dissemination and implementation (Harwood and Kassam, 2003).

The function of communication is important in achieving the following, all of which are vital in achieving affect NRM (Emongor et al., n.d.):

- Awareness raising
- Information sharing
- Facilitating learning
- Participation support
- Decision making
- Collaborating actions
- Conflict resolution
- Influencing policy environment

Effective communication is achieved by involving all stakeholders through workshops, conferences, field days and demonstrations as well as through public communication channels (Harwood and Kassam, 2003). It is not to say that communication channels and information sharing is not evident, however they are often isolated into individual sectors. For example, commercial farmers communicate within their own network through associations, however their communication with external sectors is limited. Stronkhorst et al. (2010) support this notion by demonstrates that miscommunication is evident in the region – a prime example being that the various information providers (such as extension services, UKZN, NGOs, Department of Agriculture, etc.) are unclear of their roles and responsibilities with regards to sharing information and follow up. From this stems confusion amongst land users with regards to the various projects being implemented and could result in different practices. Therefore, communication at the meso-scale, which bridges between sectors, needs to be evident to effectively integrate NRM.

4.3 Socio-Political Factors

A component of the analysis undertaken in the district investigated the socio-political factors affecting integration at a district scale. In a country with numerous and diverse cultures, and complex political past, many of the key agendas still run strong. These affect the power relations relating to the use and development of land, often undermining the formal structures in place to facilitate formalized decision making. In many cases dealing with these issues is beyond the realm of the framework proposed by this project. It is however important to recognize, document and where possible seek to overcome these issues which are best expressed by extracts from interviews with role-players in the district.

One of the DM employees with an experience of over eleven years working for local governments recalls that: “when we were IFP, municipal councillors would always appoint departmental heads who were

politically aligned with them, then the departmental heads would appoint staff that they would know – people belonging to the same party-. That was the failure of local government, they were appointing people with no qualification, no experience".

The friction between traditional authorities and municipal structures remains an issue "KZN remains a very strong province, you can't do as you wish, you have a similar thing in Eastern Cape. It's a power struggle between traditional leaders and political power. The majority of people are Zulus, the majority of land is owned by Zulus meaning tribal land[22], its 3.3 million Ha of land, so if they say no, they say no in one voice, it's not small parcels of land (Town Planner).

In the recent past "areas were created for certain people [and that] very often conservation meant eviction for the black community". In view of the displacement that took place in the name of conservation, it is not difficult to understand that the trust issues between traditional authorities and conservation authorities.

Young, female, black extension and enforcement officers from the Department of Agriculture were open in confirming that it remains a problem for them to access and work with white commercial, particularly Afrikaans speaking farmers. These deep seated cultural prejudices remain a problem.

A final example is the cultural value of cattle. Over and above the issue of whether it is overstocking or just poor grazing management, cattle have value in traditional culture. Attempts to alter stocking rates will therefore come up against deep seated cultural based resistance.

Whether or not the issues can be addressed, it is nevertheless important that the power relations arising from socio-political context are understood as they will influence how the roleplayers within that context are engaged in dealing with other issues.

4.4 Lack of Appropriate Institutional Structures

To achieve coordination across such a vast array of roleplayers operating across a range of scales and with differing mandates and demands and influence on the resources requires an institutional structure to facilitate structured engagement. The need for such a structure was demonstrated by a statement from an NGO operating the upper Thukela catchment that: "There is no institution in place. African Conservation Trust (ACT) is trying to provide coordination function, and get all people working in area to come together." The coordination function referred to is the establishment of the 'Synergy Group' which was chaired by the ACT and was borne out of the need to coordinate actions of the range of actors involved in a diverse number of NRM initiatives in the Upper Thukela.

[22] 48% of land is rural in KZN, out of which 46% of people live in traditional communal areas.

To establish an idea of what the optimal NRM coordinating structure might look like, an analysis of the strengths and weakness of existing coordinating forums was undertaken with stakeholders. The structures analysed and the strengths and weakness of each are summarized in Table 8.

Table 8: Summary the strengths and weaknesses of existing 'integrating' institutional structures in the UDM

INSTITUTION	CHARACTER	STRENGTHS/ Weaknesses
Synergy Group	• Loose association of government and NGOs operating in the upper Thukela. • Co-ordinated by NGO (ACT) • Ad-hoc meetings. • Not legally constituted.	• No legal standing which affected the ability of government officials to attend. (W) • Dependent on funding and NGO (W). • Limited and vague spatial definition – focused on upper Thukela with no specific boundary(W) • Resources – integration across all resource types (S) • Useful mechanism for sharing ideas and coordinating actions (S). • No set frequency for meetings. (S and W) as provides a level of flexibility but too irregular meetings means momentum is lost.
Catchment Management Forums	• Not legally constituted. • Co-ordinated by Government (DWA). • Ad-hoc meetings.	• Primary focus is water (W). • Limited spatial focus – to small portion of catchment (W). • Co-ordinated by Government (DWA – mandated) but other roleplayers are not (S). • Limited decision making authority (S).
WHS Buffer Coordinating Committee	• Structured forum of government agencies. • Co-ordinated by EKZNW (mandate)	• Spatial focus limited to buffer area (W) • Responding to a legal requirement – WHS Act (S) • Regular and structured operations (S) • Established for a specific purpose only – establish the WHS buffer – spatially delineate an assign controls to different zones within the buffer (W).

The criteria for an optimal NRM coordinating institution was identified based on this analysis and are listed below:

i. The co-ordinating organisation should have a legal mandate to perform this role as it assists in ensuring government acknowledgement and recognition – and therefore by officials of significant seniority to make a decision in such a forum.

ii. The co-ordinating agency should not be aligned with a specific resource such as water but have a mandate that cuts across resources and environmental management. This removes potential for bias and facilitates integration across resource types and thereby acceptance from other agencies/role-players.

iii. The co-ordinating agency must have representation at a district level to facilitate vertical integration between national and provincial government and local government and role-players.

iv. The district level is also considered large enough to incorporate biophysical systems around which management is focussed of which catchments are a good example.

v. The co-ordinating organisation and scale of operation should allow for the integration of the NRM activities into other district level operations, e.g. NRM activities that can form part of or

support Local Economic Development strategies. Another example is the consideration of Ecosystem Sensitivity areas in spatial planning via the spatial development framework and the Land Use Management Systems.

vi. The overarching district structure needs to be designed to incorporate the local focus.

vii. While the co-ordinating structure is based on an administrative boundary, the local focus should be based on resource priorities as defined by ES mapping.

viii. The structure must ensure the effective inclusion of existing localised committees and structures which operate at ground level as they have local interest and investment in terms of achieving success.

ix. Effective communication is an essential requirement for co-ordination. Communication mechanisms appropriate to the technological, language and other socio-economic factors associated with different stakeholders need to be established/utilised to achieve this co-ordination.

x. Identification of champions within the various organisations is important. It was noted that developing time and effort in building capacity with champions could be resource (time and finance) intensive in the short term, but invaluable in the long term (essential for sustainability).

xi. The strategy focus and institutional structure needs to be a-political so that it can carry on delivering irrespective of what is happening politically within government.

It was also pointed out that there are costs involved in achieving effective coordination. It is important to understand the costs of operation and source funding the structure otherwise it would fail to achieve the intended integration of managers.

4.5 A Short Term Perspective

Probably the greatest limitation of all for the various NRM initiatives within the UDM was the short term focus of the management efforts. Across the board, this relates primarily to the funding sources and structures. The synergy meeting was a useful initiative but stopped functioning when ACT's funding came to an end – as did the rehabilitation work they were involved in. Having developed very useful rehabilitation and monitoring techniques UKZN funding came to an end. Even the national and provincial NRM programmes confirmed that their planning and implementation horizon is dictated by government budgeting processes , i.e. three years, and that their future is dependent on political agendas. As a consequence there is limited or no focus on monitoring and evaluation. Brundvig[23] (pers comm.) indicated that despite the need for monitoring and evaluation, such processes are limited to audits which simply cross-check expenditure and employment requirements. There is no monitoring of whether the promoted ecological benefits are being achieved.

[23] Ryan Brundwig (DWA) – Working for Water

The consequences of the short term focus and findings of the analysis are that:

- It results in a waste of effort where the management is not sustained, i.e. alien species are eradicated but return because there is inadequate maintenance.
- While it creates employment and builds capacity through training, the benefits are undermined by the temporary nature of the employment and limited security.
- The lack of monitoring and evaluation prevents adaptive management taking place.

What was also apparent from the discussion was that Government is not able to finance NRM alone. Private sector involvement coupled with innovative economic instruments are required that sustain NRM.

4.6 A Limited View of the Problem and Response

An analysis of the management and rehabilitation initiatives in the project area revealed the following regarding the scope of these interventions:

- Focus on one aspect of management
  The various initiatives focus primarily on one type of management intervention. For example donga rehabilitation, clearing alien invasive or fire management. Due to the lack of integration in planning they work in isolation of each other. While there are undoubtedly areas where more than one activity is being undertaken in a landscape it was identified as a weakness that for example, a particular catchment may have some level of erosion control taking place when it also requires improved grazing and fire management, i.e. a landscape approach is required.
- The response is generally limited to dealing with the symptom and not the cause.
  This was raised by the local communities who were becoming despondent after rehabilitating dongas without addressing the overgrazing and lack of fire management which they know are the cause. The interconnectedness between human activity and the state of natural systems means that there is invariably more than one cause of the associated impact. In addition to poor grazing and fire management, erosion also a product poor infrastructure (roads are cut haphazardly across the mountainous landscape). A large proportion of the work and resources are focused on activities such as donga rehabilitation and clearing of alien invasive species. The UKZN work was the exception, where they had identified the cause but had enjoyed limited success in dealing with them due to funding issues.
- The cause is similarly linked to drivers that are not necessarily understood.
  For example, it was reported by rangeland experts that is not necessarily overgrazing that is the issue but rather stock management. Communities graze their cattle close to their homesteads for a number of reasons – but primarily because of stock theft from the neighbouring Lesotho, which is linked to trade in 'dagga' (the criminals enter South Africa with dagga and return with cattle). Unless these socio-economic drivers are unpacked, understood and addressed the impact on the resource will continue. While it is necessary to restore land before it degrades beyond a point where it is recoverable, the discussion raises the question as to whether it is not more appropriate to focus a portion of the resources on dealing with these drivers. A concern

may be that the NRM programmes for example generate employment. But so would the training of increased numbers of stock theft law enforcement officers.

Having developed an understanding of the challenges to achieving integration in NRM, the following section presents the proposed INRM framework one element at a time.

5. BUILDING THE INRM FRAMEWORK

The INRM framework is constructed in this section, one element at a time. The approach taken is to provide the following information and understanding for each element:

- The approach taken in establishing or applying the element in the Afromaison case study.
- A description of any tools that were developed to support the application of the element.
- A summary of the value of the element in terms of improving integration. Invariably each element assists in addressing more than one aspect of integration, i.e. such as integration across scale, or time, resource types.
- Discussion about the challenges to developing or applying the element. In several cases, the challenges are addressed to varying degrees by other elements in the framework and they are cross referenced.

Before proceeding with the analysis and construction of the framework, it is useful to reflect on the views of Campbell et al. who recognize that "The challenges we have identified are not new: they have been accepted recognized and analysed for more than 20 years, and it is clear there are no simple solutions".

> 'Our seeming inability to translate the approaches into practical achievements on the ground is leading to widespread disillusionment. In frustration, we abandon one set of buzzwords and replace them with others. What is surprising is not the improvement of approaches over the past 40 years – rather it is their fundamental similarity.' Campbell et al.

While it is clear that INRM conceptually requires a complex systems approach, local communities and district governments rarely have the resources to deal with the multiple dimensions of truly integrated management. Recent studies on implementing Integrated Water Resources Management (IWRM) (Giordano and Shah 2013) and ecosystem services approaches to planning (Ruckelhaus et al., 2013) have stressed the importance of pragmatism over theoretical rigor in working with decision makers. The tools developed in Afromaison are therefore incremental, rather than fundamentally new directions, but represent an attempt to build from existing knowledge to provide simple, pragmatic approaches to dealing with the inherent complexity of INRM.

The elements that have been considered essential to improving integration across resource types, scale, stakeholders and time are:

1. Ecosystem services foundation to NRM.
2. Meso-scale focus.
3. Appropriate institutional structure.
4. Long Term Focus
    a. Treating the symptom and the cause.
    b. Economic instruments as incentives for INRM.

c. Indicators as a basis for a monitoring and evaluation programme (adaptive management).

5. Effective stakeholder engagement.

5.1 Ecosystem Services Foundation to the NRM

The Afromaison approach to INRM is founded on the use of the Ecosystem Services concept. While the primary focus of using ESs was to prioritize management spatially, the approach plays a major role in achieving integration in terms of a range of aspects as described in this section. Figure 15 provides a reminder of the various categories and sub-categories of services.

Figure 15: The categories and subtypes of ecosystem services

The use of Ecosystem Services to inform planning has been around for some time with various guidelines having been produced (GIZ 2012). What is useful about the Uthukela Case Study is that it provides an applied example in a South African context using local data sets. The approach and outcomes have been documented as a complete report for the Afromaison project and is in effect a useful tool (Pringle and Quayle, 2013).

Application of the Ecosystem Services Concept

The following approach was adopted in using the ESs concept as the basis for developing the INRM Framework.

i. Prioritizing Services

There are a wide range of ecosystem services types within the various categories. Mapping all of them detracts from the prioritization process and subsequently spreads often limited management resources thin. The first step therefore involved selection of the following services which were considered to be important within the UDM. The selected services were Food (crop production), Freshwater regulation, Habitat, Tourism, Soil retention and Grazing. Discussion with stakeholders in selecting important services is an important process in itself as it starts to generate an appreciation across different user groups and sectors of the value of different services and the resources they generate to other users. The motivation for the selection of these services is provided below.

- Food – Ecosystems provide food for both humans and livestock. The UDM is an important agricultural production area. The majority of the district is best suited to extensive forms of agricultural land use, such as livestock production and game farming on naturally occurring veld. However, certain areas in the district, primarily around Bergville and Winterton, and smaller pockets inland from Estcourt, provide arable soils for cultivation (Wood, 2011). Consequently, the "food" service was split into two services namely grazing and crop production, both of which were included in the current study.
- Freshwater – The UDM is bounded by the Drakensberg Mountains in the west. This mountainous area is most important water source of South Africa, producing approximately 25% of the country's available water and supporting almost 50% of the GDP (WWF, 2013). The availability of this water is dependent on both its supply and regulation, which in turn reflects the provisioning and regulating components of the freshwater service respectively. Both components of the service were considered simultaneously in the assessment of freshwater.
- Habitat – The habitat service underpins almost all other services and is therefore critical to the maintenance of ecosystems and livelihoods. The UDM provides a diverse array of habitats and species, many of which are currently threatened and have higher conservation status. The biodiversity in the Drakensberg Mountains particularly, was one of the fundamental aspects supporting the motivation for its proclamation as a WHS. The habitat service was therefore included in the current study.
- Tourism – The UDM is one of South Africa's prime tourist destinations with approximately half a million tourists visiting the UKhahlamba Drakensberg Park annually. Tourism was therefore considered to be an important service in the municipality and was thus included in the current study.
- Soil Retention: In addition to the services listed above, soil erosion has been identified as a major issue in the municipality. During the early to mid-20th century, extensive portions of the district were ploughed and planted to maize and other crops by both commercial and small-scale farmers (Wood, 2011). This included large areas of soils which were unsuited for cultivation. The shallow topsoils and subsoils in these areas have poor water holding capacity and crop roots struggle to penetrate through the soil. The highly erodible nature of the soils, coupled with intense summer rainfall, have resulted in the degradation of extensive areas through the loss of large amounts of topsoil and some natural vegetation cover. The soil retention service was

therefore considered to be a critically important service in the municipality and was included as an additional service in the assessment.

ii. Mapping Priority Areas

The aim was to prioritize management by identifying areas that require management because, either:

- They are currently supplying high levels of ecosystem services that must be retained for both present and future use (CONSERVATION FOCUS)
- They have the potential to supply high levels of ecosystem services and must be rehabilitated or managed to meet the current demand for these services (REHABILITATION FOCUS).

In identifying these priority areas, the prioritisation process undertook the following steps:

i. Identify and map the supply (SS) of each selected key service.
ii. Identify and map the demand (DD) for each selected key service.
iii. Combine the supply and demand maps to establish priority management areas for each selected key service. PRIORITY MANAGEMENT AREA = High ES DD + High ES SS.
iv. Combine the priority area maps for all selected key services to identify integrated priority management areas for both conservation and rehabilitation. The final output of the prioritisation process is therefore two maps. The first map denotes areas currently delivering a range of services which therefore require management interventions to protect these services. The second map indicates areas which have the potential to supply a range of services which are currently needed, if restoration measures are implemented.

The following approach was taken to mapping SS and DD for the selected ESs.

Mapping Supply – Different land covers are able to supply different types and levels of ecosystem services. In order to depict this relationship, a simple assessment method was employed which scores land cover types from 0 to 3 in terms of their ability to supply the selected service. A score of 0 indicates that the land cover type provides little or no service while a score of 3 indicates that the land cover type plays an important role in the supply of the service. These scores were generated through an expert workshop and were used where no actual or surrogate data was available. To simplify the assessment, the 32 land cover categories (from the KwaZulu-Natal 2008 land cover) that occur in the study area were collapsed into 12 broader categories based on expert input. The condition or health of the environment is assumed to strongly influence the level of ecosystem service supply. As part of determining ecosystem health in the current study, a vegetation condition index based on Normalised Differential Vegetation Index (NDVI) data, was developed as detailed in the main report to assist in arriving at level of supply at the resolution of the land-cover units.

Mapping Demand – Demand has been mapped based on a varying socio-economic data which is specific to the service. The specific data sets used are explained for each of the key ESs.

Integrating SS & DDD to Establish Priority Management Areas (PMAs) for Priority Services

The series of maps provided in Figure 16 below show the spatial supply of habitat services in the UDM, the demand for them, and the prioritized areas for management which integrates areas of high demand and supply.

The areas in green in the PMA map are those areas which are currently providing good habitat services and need to be managed to retain these services. The areas in shown in red are those that supply important habitat types, but which are degraded and require rehabilitation measures to meet conservation targets.

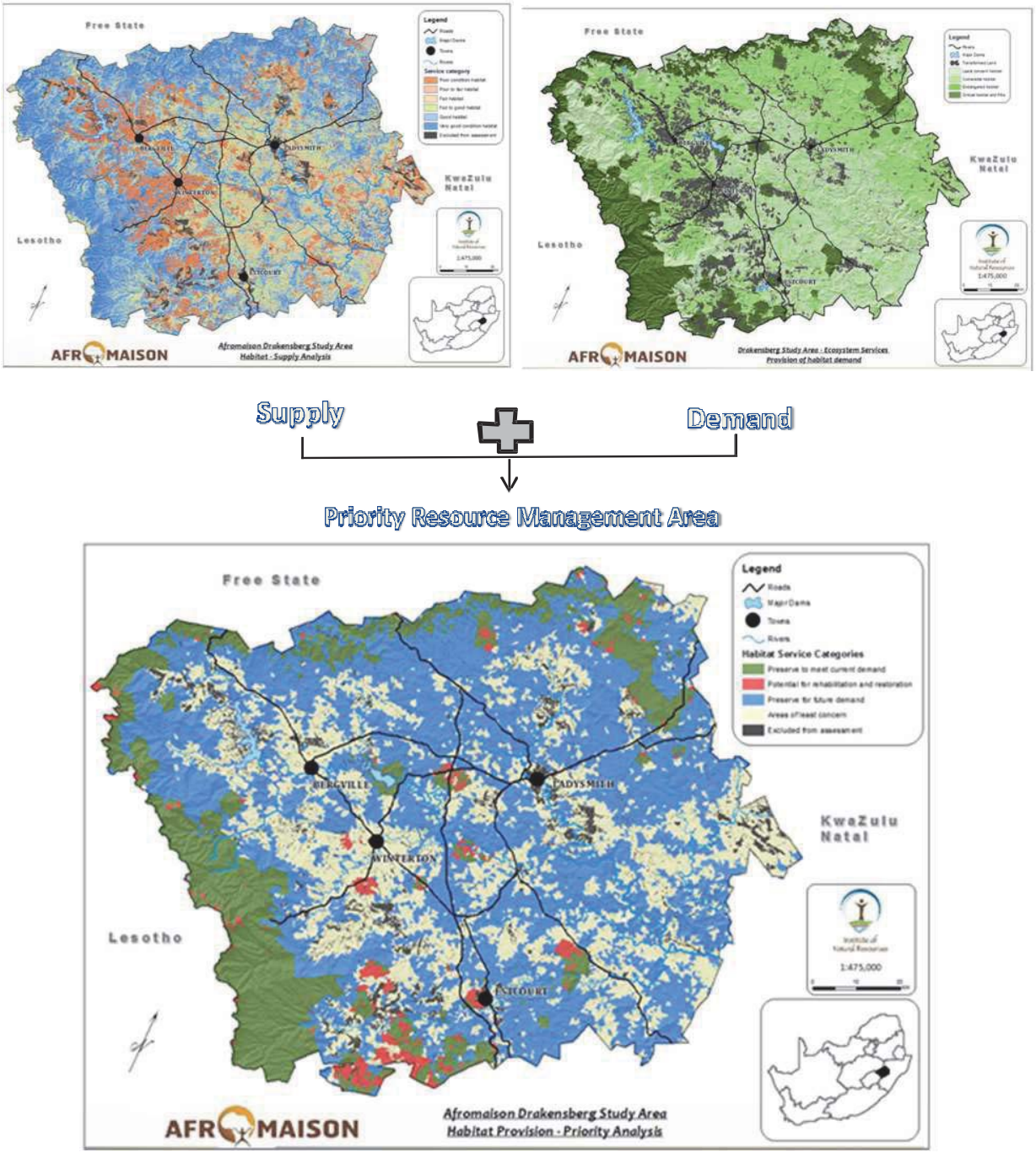


Figure 16: Example of the process for mapping priority management areas for selected ecosystem services in the Uthukela District Municipality

Identifying Priority Management Areas across Key Services – for Management

Having mapped the PMAs for each priority service, the PMA maps were combined resulting in the following two prioritization maps. Figure 17 below is the product of overlaying all "High supply and high demand" areas and counting the number of services present for each land parcel. The higher the number of services that can be secured on a land parcel the higher the priority for focussing management effort there. It is clear from Figure 17, that the western regions along the Drakensberg Mountains are priority areas from an ecosystem service perspective as in large areas up to all 5 of the priority areas (indicated in brown) for priority services can addressed. The buffer is similarly important with 4 services (yellow) being delivered in large portions of the buffer area.

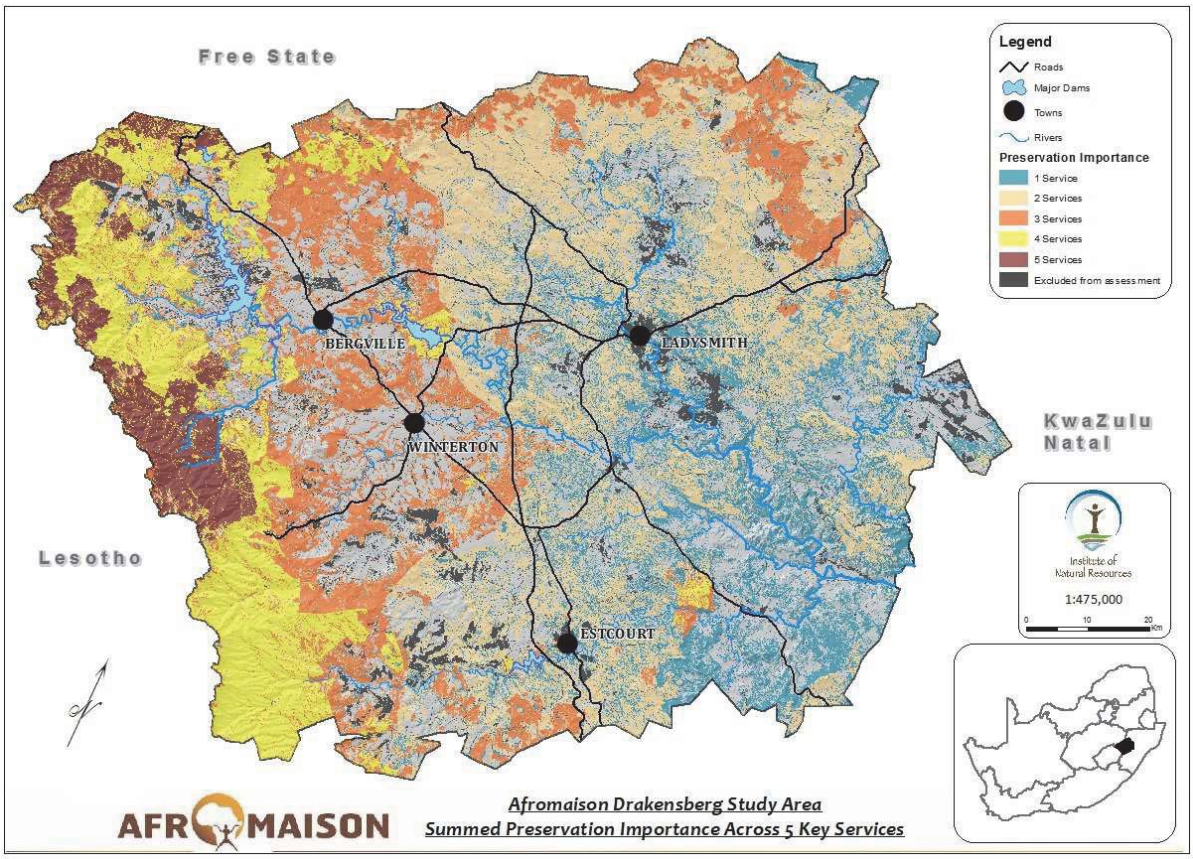


Figure 17: Identification of priority areas for the protection of ecosystem service delivery.

Using the same method as described above, but isolating and using all areas which may require some level of intervention (including but not limited to restoration and rehabilitation) a number of critical areas for such interventions can be identified.

At a broad level, the results indicated in Figure 18 are that rehabilitation interventions implemented in the foothills of the Drakensberg, particularly around Woodstock dam, and communal areas to the south of Winterton, will improve more than one service and will thus generate multiple benefits. It is interesting that this pattern overlaps with where the most significant effort has been directed in the

Uthukela District to date. It does however also highlight the fact that there are areas elsewhere in the region that also requires focus.

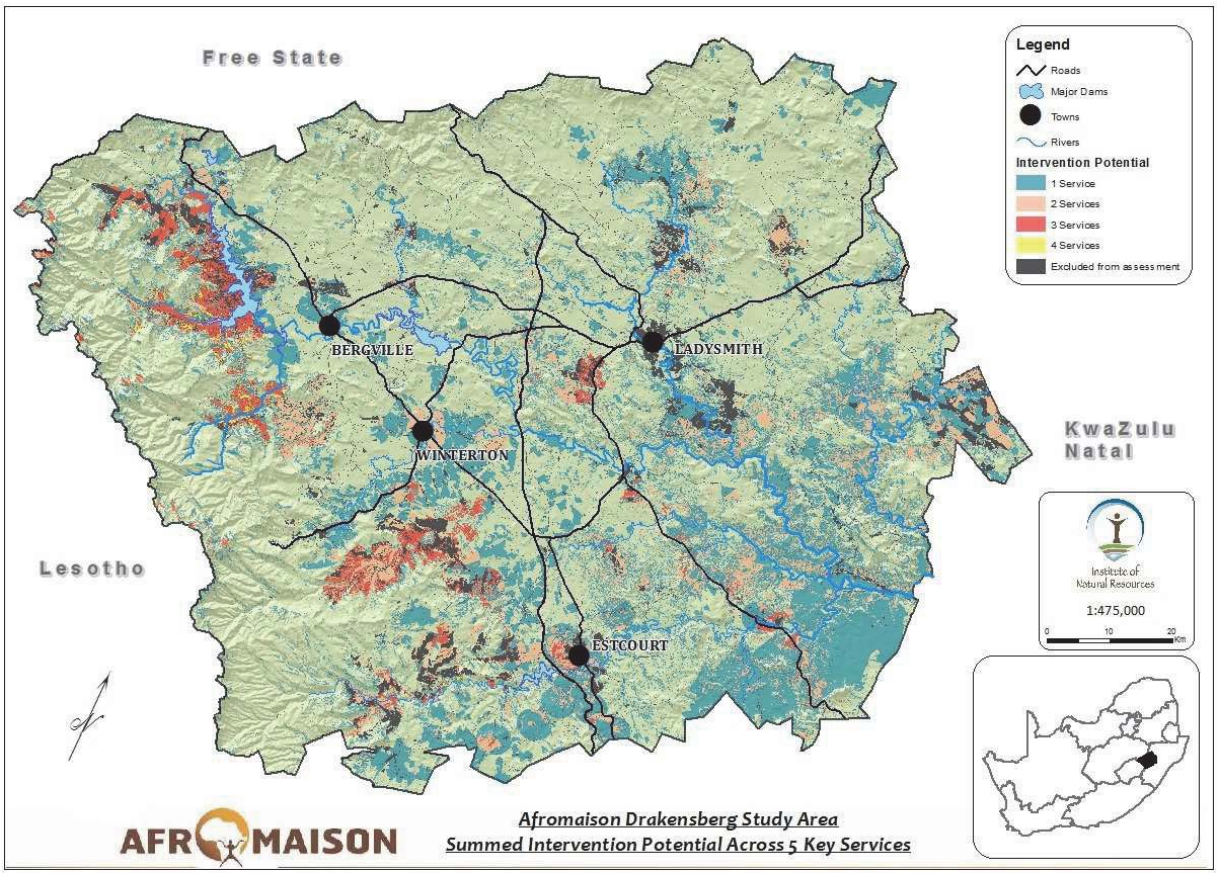


Figure 18: Identification of priority areas for land management interventions including rehabilitation and restoration.

Benefits for Integration

The ecosystem services approach serves achieve integration between natural, economic and social systems, across resources and across scale and boundaries.

i. Integration of Natural, Social and Economic Systems

As discussed in chapter 3 limiting the definition of natural resources to only the extractive or biodiversity value diminishes the overall value of natural systems to the social and economic systems. The Ecosystem Services (ES) approach gives effect to the sustainability model depicted in Figure 19 because it highlights the interdependencies between the three systems, i.e. it integrates the natural, social and economic systems. So while the ecosystem services have not been quantified in monetary terms, the quantification of demand acknowledges the value of the

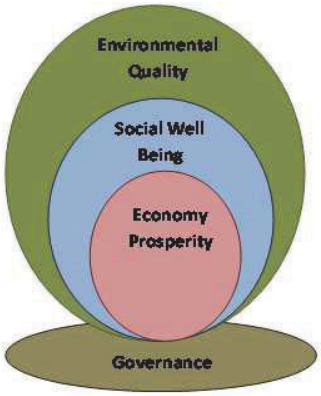


Figure 19:The sustainability model

benefits derived from the services delivered by ecosystems. In so doing it emphasizes the need to consider retaining systems in their natural state when faced with applications for land-use change.

A limitation of integrating management based on administrative boundaries is that natural systems overlap and cuts across them. As a result the importance of managing a small portion of a particular resource occurring within a municipality's jurisdiction may be diluted. The consideration of demand facilitates the consideration of the 'cumulative', or combined socio-economic value of resources beyond administrative boundaries in prioritizing management focus.

The approach also supports government mandates, particularly local governments, who are responsible for providing the services, such as adequate clean drinking water, that ecosystems supply. Therefore, the ES approach gives effect to the sustainability model by enabling integration across resources, scales and in support of government mandates through the inclusion of the key elements of the sustainability model.

ii. Integration Across Scale and Boundaries

A valid concern about planning in line with administrative boundaries when considering natural resource management is that administrative boundaries are not aligned with natural system boundaries such as catchments or ecotones. The demand assessment undertaken overcomes this by analysing the value of the land parcels delivering a service to users beyond the borders of the municipality. For example, the fact the Drakensberg-Ukhahlamba World Heritage Site attracts international tourists elevates the importance of managing at a level to that secures its WHS status. Similarly the catchments above Woodstock Dam have higher management priority because the water is transferred from this catchment to the Vaal system and supports the countries primary economic hub. In summary, the ESs approach facilitates integration across scale and boundaries.

iii. Integrating Management Across Resources

As discussed throughout the document, management of resources still tends for various reasons to occur in 'silos', i.e. the Department of Water Affairs manages Water resource and conservation agencies focus on biodiversity while forestry conserves forests. By providing an integrated understanding of the value of resources at a landscape level across resource types, the ESs approach seeks to provide integrated focus across these 'silos' and thereby break them down so that a landscape and not a 'resource approach' is adopted. It gives effect to the point made in the NSBA (Driver et al., 2005) that "Quality , quantity and sustainability of water resources are fully dependant on good land management practices within catchments, so that the fate of our countries water resources relies on an integrated approach to managing water and land".

iv. Integrated Stakeholder Understanding

The involvement of stakeholders in identifying the services that they depend on to support their economic activity or well-being is a very useful process for developing understanding of the need to manage effectively to sustain the benefits they derive from natural systems. But more importantly, if undertaken in a forum with disparate users, they are able to understand the importance of the services to other users, and the implications of their management actions for others. The lack of a common

understanding of these interrelationships between users, systems and the flow of services between them is generally known but seldom defined. The ecosystem services concept is therefore a very useful concept for facilitating a foundation of integrated stakeholder understanding from which to continue working forward to a combined vision, strategy and actions because there is a holistic appreciation of the sustainability context.

v. The ES Concept Supports Local Government in Delivering on Mandates

The delivery of basic services such the supply of clean water, sanitation services and waste water treatment is a core mandate of Local Government. Local Economic Development (LED) is another mandate which requires that LG draw on ESs, such as productive land for agriculture projects and beautiful landscapes to support tourism and recreation sectors initiatives. The ESs concept assists in establishing an understanding of the relationship between services delivery and resource value which is essential if LG is to plan appropriately. It acts as understanding to invest in ecological infrastructure. This understanding is illustrated by the lead taken by the eThekwini Municipality in establishing the Umgeni Ecological Infrastructure Partnership (UEIP). The purpose of the partnership is to work together in securing and rehabilitating ecological infrastructure throughout the catchment (outside of the Municipal boundaries) to ensure the sustainable supply good quality water to the city of Durban which is economic hub and houses a large proportion of the provinces population. As a tourist destination it also requires good water quality – an issue which has in the past affected water quality along its beaches and resulted in them losing their blue flag status.

Challenges for Replication

In terms of challenges for replicating this approach in a standardized manner it is data dependant. KwaZulu-Natal is a relatively data rich province with a provincial land-cover produced every three years which is important that this coverage is an important input in determining levels of supply for most services.

5.2 Meso-Scale Approach

A primary challenge in INRM is identifying the scale at which vertical integration is best achieved, i.e. at what level of governance is policy best converted into effective action. An associated issue is whether integrated management should be focused according to natural boundaries such as catchments, or administrative boundaries.

Application in Afromaison

The Afromaison project is addressing INRM through a meso-scale approach which is considered to be effective in incorporating natural and administrative elements of management. The meso-scale is defined as the district municipal level as depicted in Figure 20.

Benefits for Integration

The DM scale is perceived as ideal for focussing integration of NRM for the following reasons:

i. Supports the Decentralization Process – This scale is appropriate in view of the regionalization of provincial departments to the district level – particularly the Provincial Department of Agriculture and Environmental Affairs and recognition in the consultation process, that Local Government does not have the capacity or resources to meet and implement their environmental responsibilities.

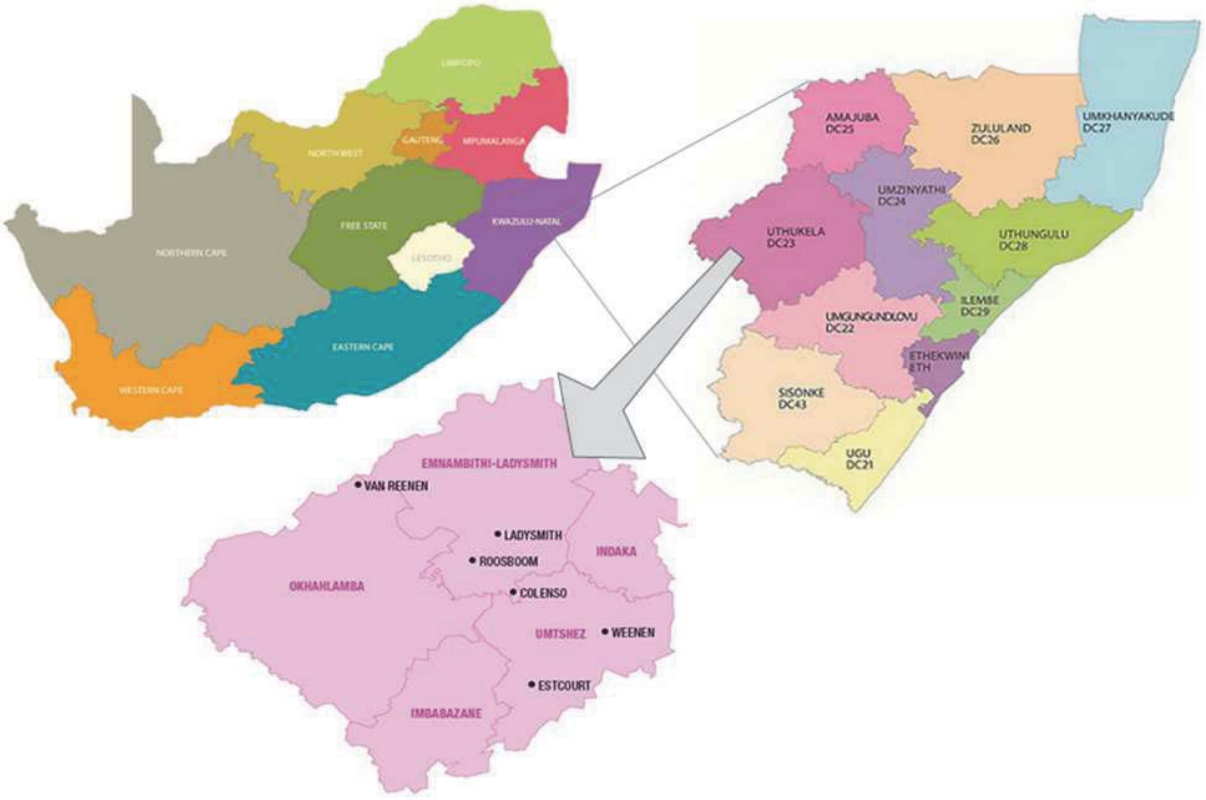


Figure 21: Overview of the District Municipality (DM) Scale

ii. Vertical Integration – The DM is the scale at which policy meets action and government interacts directly with constituents. It is also the appropriate scale for local priorities to focus the finance and resources of provincial and national government. The use of the Ecosystem services approach to identify Priority Management Areas provides the information for municipalities to guide provincial and national government spending in their jurisdiction. This is particularly in light of the Natural Resource Management Programmes run planning at a national or provincial scale, and where evidence from the Uthukela District,

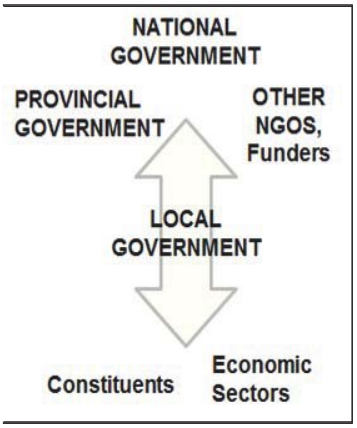


Figure 20: The importance of local government in achieving vertical integration.

is that the co-ordination is not sufficiently aligned to translate into efficient effort on the ground.

iii. Horizontal Integration – Tools and processes for integrated planning and action are in place through the IDP framework. The Afromaison approach seeks to enhance and support the value of the IDP framework by improving the way in which Natural Resources are considered throughout the various elements of the IDP. By focussing the INRM framework within the DM it will improve the level of input from associated provincial and national roleplayers as well as the local level roleplayers such as the NGOs who work directly with communities and traditional authorities and currently exclude municipalities.

iv. Responsibility for development planning – lies with Local Government, who are therefore able to inform use/protection of land and associated resources through integrating spatial planning instruments such Land-use Management Schemes and associated controls. The planning at a district scale also informs spatial planning at the local municipal level so the DM has a wide scope of influence.

v. Appropriate Size – the DM scale is large enough to account for large-scale resources but not too localized that the broader picture and cumulative issues that inform priorities are lost. This is illustrated by the Uthukela DM including the Upper Uthukela Catchment and the majority of the high value arable land delineated by the Department of Agriculture at this altitude (several farmers associating).

Challenges for Replication

The primary challenge to the DM level being the focus for INRM is that Local Government as a relatively new level of governance in South Africa is that it is in many ways failing to meet the numerous and diverse responsibilities placed on it. This is illustrated by the increase in service delivery protests which relate to the failure in many instances of Local Government to meet their most basic of mandates. The allocation of additional responsibilities or mandates not necessarily considered core to LG are unlikely to be achieved in this current context. In recognition of this challenge, the institutional structure proposed in the following section and the framework as a whole seeks not to add significantly to the burden of municipalities, but rather to facilitate co-ordination at this scale, with all role-players sharing responsibilities.

5.3 Appropriate Institutional Structure

As indicated in the preface to this chapter, most of the elements in the proposed framework are designed to take existing thinking forward or add to it. The INRM forum presented in Figure 22 below is however the one element that does not exist in the current institutional structure. In view of the fact that getting the responsible agencies to work together is at the core of achieving overall integration, and that none of the existing institutional structures were identified as suitable for integrating across scale, resource type and so on, the development of a new structure was considered necessary.

Structure and Operation of the INRM Forum

In accordance with the Meso-scale approach the structure is located and housed at the District Municipality. In recognition of the lack of capacity at LG level, it is proposed that the forum is chaired by the Department of Environmental Affairs who have funded a single environmental management staff member in the District. This would however be too large a responsibility for a single official. It is therefore proposed that they are supported by the provincial Department of Agriculture and Environmental Affairs who have a regionalised office in Ladysmith where the District head offices are also located. The selection of the DEA and DAEA (Environmental Management) is based on Integrated Environmental Management (IEM) being the mandate of the DEA as allocated in terms of NEMA.

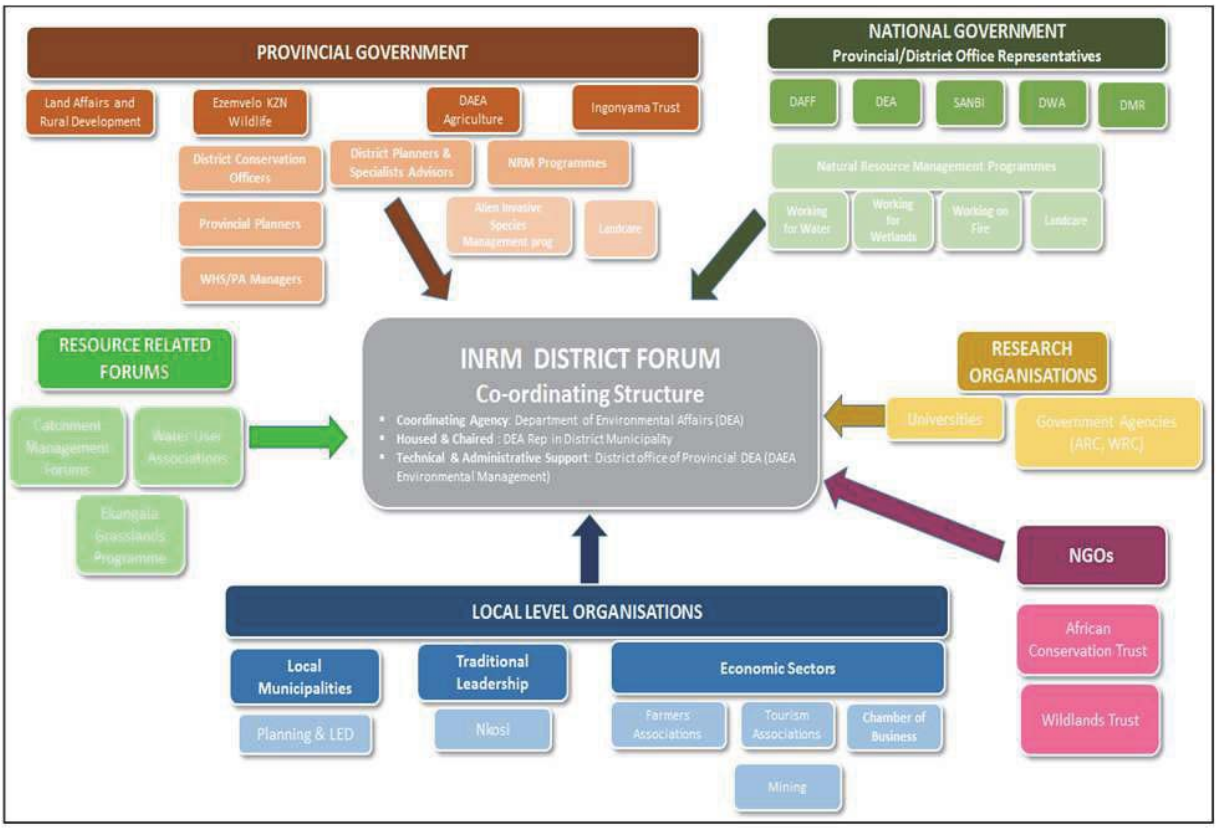


Figure 22: Proposed INRM District Forum

The analysis of the institutional challenges in the process identified a range of criteria for an optimum institutional structure. The following table summarises how the above structure meets these criteria.

Table 9:Compliance of the INRM forum with criteria for success

CRITERIA	MOTIVATION FOR COMPLIANCE
1. Co-ordinating organisation should have a legal mandate	Integrated environmental management and institutional co-ordination is the mandate if the Department of Environmental Affairs and its provincial counterparts in terms of NEMA.
2. Co-ordinating agency should not be aligned with a specific resource.	The DEA and DAEA operate across all natural resources, and importantly in line with the definition of the environment in NEMA, are also required to consider the interrelationship between the natural, social and economic systems. They are therefore the appropriate agency to fulfil this co-ordination role.
3. The co-ordinating agency must have representation at a district level to facilitate vertical integration	The DEA have a funded position within the Uthukela District Municipality. The Provincial Department (DAEA) have district offices located within Ladysmith that would allow them to support the National representative in coordinating this forum.
4. The co-ordinating organisation and scale of operation should allow for the integration of the NRM activities into the IDP plans, programmes and projects.	Activities such as alien clearing and wetland restoration can form part of or support Local Economic Development plans and projects. The Ecosystem Sensitivity areas can and should be integrated in the development planning via the Spatial Development Framework (SDF) and the Land Use Management Systems (LUMS). The inclusion of NRM projects in the IDP which has a 5 year horizon, will assist in overcoming the short term 1-3 year focus of national and provincial government NRM programmes.
5. The overarching district structure needs to be designed to incorporate the local focus.	The structure is designed to include representation from localised stakeholder groups such as farmers associations of which there are approximately 10 within the District and similarly, traditional authorities.
6. While the co-ordinating structure is based on an administrative boundary, the local focus should be based on resource priorities.	The management focus will be directed by the Ecosystem Services mapping. The INRM forum will refine the focus within these priority areas for specific programmes and projects.
7. Appropriate communications mechanisms need to be established/utilised to achieve co-ordination.	The starting point would be to develop, maintain and distribute an NRM database – knowing who is involved in what and how to contact them is the basic requirement. Other actions would be to link existing communication mechanisms, e.g. websites and incorporate different role-players in forums from which they would benefit, e.g. traditional rural farmers in commercial no-till club so they could benefit from the existing knowledge and know how.
8. Identification and capacity building of champions.	The selected representatives of the various roleplayers who sit on the forum and those who play a lead role in designing and implementing NRM projects in specific areas will be likely candidates. Several of the government agencies have budget for training, which should be targeted at such individuals, who will also benefit from learning through involvement and employment in the NRM forum and initiatives.
9. The strategy focus and institutional structure needs to be a-political.	By focussing the strategy on priority areas based on a range of resource values (to local and broader society) and not linked to administrative boundaries (as is often current practice), that the political focus will be diluted – it can never be totally overcome.
10. It is important to understand the costs of operation and source funding for the structure.	Given that the structure is designed to assist the various role-players with existing mandates and achieve co-ordination that should be (and is to a degree) taking place, the idea would be that funds come primarily from existing budgets of the government departments. By each of the key government departments allocating budget, this creates an incentive for them to all attend and be involved. Additional funding may be required to ensure involvement of role-players who lack finance. The idea is that the saving gained by planning, implementing and monitoring in a coordinated way would more than offset the additional costs of this structure. Important costs to factor in to the calculations are: - Cost for getting marginalised stakeholders to meetings – this essential if structure is to be representative and truly integrative. - Cost of formalizing the monitoring and evaluation programme. Again it is proposed that this system draw on information and data that is collected as part of departmental functions. But there are known be gaps to plugged and this needs to be done if the M&E is to be effective.

The role of this overarching structure or forum is to establish horizontal and vertical integration at the District level and facilitate co-ordination to improve the efficiency and effectiveness of resource management with the priority areas. The following should be noted when considering the role of this structure:

While an appropriate scale for achieving integration, the district is still however a large area and specific programmes and projects will be developed within more focussed areas. These will need to be designed, and implemented by other roleplayers within the structure. So it is not the role of the structure of the DEA/DAEA who manages it to oversee all INRM activities – but rather to:

i. Ensure that all relevant role-players are included and affectively engaged in co-ordinating efforts within priority areas, and that the communication mechanism established to maintain this co-ordination is maintained.
ii. In line with the previous point – there are many existing success stories at a local level that have the potential for enhancement and replication. These need to be identified and built on (upscaled).
iii. That the specific INRM plans and activities align with and draw on provincial initiatives and funding, as well as resource related institutions and plans (CMFs and Catchment Management Plans).
iv. That these plans and activities are integrated into district level mechanisms such as (LED) and inform district level planning (SDFS and LUMS).
v. Track progress via the M&E programme, which again is not the sole responsibility of the co-ordinating body or those who chair it.
vi. The overarching organisation is not required to meet more than 4 times a year to ensure co-ordination continues. Co-ordination will take place on a more frequent, day-to-day basis in specific projects and activities.

Creating a new structure in an institutional context of under capacitated, often under resourced stakeholders may be considered an added burden. It should therefore be remembered that the aim of the structure is not to replace or add to, but to galvanize existing efforts to increase efficiency and optimize resources while assisting in meeting the mandates and objectives of the stakeholders.

Given the focus of this project, it is important to reflect on this structure in relation to Water Resources Management. The Water Act requires involvement of stakeholders in such institutions of which the CMA is the primary structure. The current re-alignment of the CMAs to the provincial boundaries will make them very removed from the regional or catchment scale – and issue son the ground. It is contended that this will in effect work against the aims of the NWA because it will not be possible have small stakeholder groups represented at this scale. This issue is exacerbated by the removal of Water User Associations and the limitations of CMFs discussed in the document because these institutions provided an outlet for representation at a smaller scale. This forum is considered to provide an appropriate alternative because:

- It provides an institutional mechanism at an appropriate scale between the CMFs and the new provincial CMA into which CMFs can feed – not leaving stakeholders too far removed from decision making structures.

- Because it is a multi-stakeholder platform, it overcomes the limitations of water centred institution by including the roleplayers who impact on the water resources, i.e. it achieves the requirement proposed in the NSBA (Driver et al.) , that:
    - "Quality , quantity and sustainability of water resources are fully dependant on good land management practices within catchments, so that
    - "The fate of our countries water resources relies on an integrated approach to managing water and land".
- A further benefit is that because the costs of operating the framework are shared across the key agencies, the financial burden on any one department is not significant. Unaffordability was one of the main reasons for the re-alignment of the CMAs from 19 to 9 WMAs, so this is seen as another benefit in terms of addressing the challenges currently faced by DWA to integrate stakeholders into resource management. Furthermore, it is suggested that the savings achieved through better integration will offset any costs associated with setting up and running this forum.

5.4 Long Term Focus

The concept of sustainability is founded on the principle that management decisions taken today need to consider the future implications of that decision. The following three issues were identified as limiting current management within the UDM to a short term view

i. Treating only the symptom and not the cause of the issue.
ii. The lack of finance to plan and/or sustain management in the long term.
iii. The lack of monitoring and evaluation programme which is an essential ingredient for an adaptive management system.

The approach has identified responses to each of these to these issues.

5.4.1 Treating the Symptom and the Cause

There is a need for management actions to address issues such as erosion of terrestrial environments to reduce the associated impacts of sedimentation of water resources. However the current focus on the symptoms without addressing the cause of these issues means that these symptoms will prevail in the long term. In other words if we want to move towards an improved state of natural resources it is important to identify the drivers and assign resources to them. It may even transpire that it is cheaper to fix the cause than the symptom.

The Afromaison approach involved considerable interaction with stakeholders to understand the drivers of the resource issues and how these relate to the socio-economic systems which significantly influence decisions regarding the allocation and use of natural resources. For example, cattle are grazed in concentrated areas close to households because of the threat of stock theft. Similarly indiscriminate fires also are used to lure cattle away from homesteads as part of stock theft tactics.

The development of the strategy required that the relationship between drivers/cause, impacts and response was carefully defined in order that the economic instrument acted as an incentive to support the selected management interventions and to alter the cause of the negative impact. The example of the above relationship from areas in the WHS buffer zone is presented in Table 10 below. The economic instruments selected for this management area were identified and designed based on their appropriateness in supporting the management actions and addressing the driver or underlying issue

Table 10 Priority environmental issues, and the drivers and underlying causes of these.

Environmental Challenge	Drivers of Environmental Challenges / Problems	Underlying Cause	Intervention
Degradation of grasslands with resultant loss of productivity and ecosystem services potential (local focus on ecosystem goods- grazing - and services - water production)	Poor grazing management resulting in degradation of grasslands, increased erosion and declining biodiversity	Overgrazing - Stocking rates too high but driven by cultural and traditional values associated with livestock; livestock kept too long in areas close to homesteads to avoid theft	Improved grazing management (e.g. rotation; alternative fodder; stock reduction) improve herd quality to reduce quantity
			Rehabilitation of dongas (gully plugging, gully cutting) and re-vegetation
		Inappropriate burning practice e.g. to stimulate new growth for grazing but at wrong time of year; by thieves and poaches to draw animals into a target area etc.	Improved burning practices and emphasis on need for grazing and livestock management
		Soil erosion due to overgrazing, uncontrolled tracks, over use of preferred herding routes	Inclusion of green infrastructure to buffer paths and tracks and footpath planning and maintenance, Soil erosion control with cross-slope barriers - contour bunds; terraces etc.
		Wetland degradation due to grazing in wetlands / poor grazing management	Improved Wetland management
	Soil erosion and degradation of grasslands and biodiversity loss	Poor road construction and track construction and poor maintenance	Planning and maintenance of new and existing roads by District and Provincial authorities
		Poor sighting and maintenance of quarries and borrow pits for road construction and maintenance	Management plans for borrow pits (not part of current interventions) by District and Provincial authorities
		Soil erosion due to overgrazing, inappropriate burning, large number of unmaintained paths and tracks	Improvement of herd management practices; Erosion control and re-vegetation
		Invasive Alien plants	Invasive control measures
		Poor distribution of water resources	Water harvesting and infrastructure

Benefits for Integration

Developing an understating regarding the integration across driver, cause, and impact is essential if a holistic approach is to be developed that will avoid a waste of resources where the focus is on the symptoms alone. It also allows for a full appreciation of the range of different tools that may be required to address the drivers, e.g. legislation, training and awareness and economic incentives. It may also be that efforts allocated to the cause may be more cost efficient than simply allocating resources to the symptoms.

5.4.2 Economic Instruments as Financial Incentives for Sustained NRM

The lack of finance to sustain the necessary inputs (across planning, implementation and monitoring) and the involvement of necessary stakeholders was identified as one of the most significant factors undermining the long term success of NRM interventions. The inclusion of the Strategic Infrastructure Projects 19 which focusses on ecological infrastructure, to realize the aims and objectives of the in the National Development Plan will increase the number of jobs created by government within the Natural Resources Management Programmes. It was however apparent from the Uthukela case that government alone cannot finance resource management at a scale and intensity that will have the required reversal in the decline of natural resources. The risk therefore exists that the increased focus on resource management under the NDP may not be sustainable if driven by Government alone.

There has been a considerable work undertaken in the upper uThukela Catchment towards the establishment of economic instruments[24] – specifically a Payment for Ecosystem Services (PES). The scope of relevant investigation includes:

- An assessment[25] of the feasibility within the upper Thukela Catchment to develop a PES system which focussed on key water related ecosystem services. The project proved through modelling that improved land management will have a significant positive impact on streamflow and the financial value of the associated jobs and improved delivery of water related services. The report also investigated institutional structures for facilitating such a trading system.
- The University of KwaZulu-Natal in association with Working for Water, the WRC and Ezemvelo-KZN Wildlife has tested different restoration techniques and the establishment of monitoring methods as referred to in the previous sections.
- A subsequent report by Zunckel[26] undertaken for SANBI investigated the establishment of a market supply chain, ensuring a market was established and looked at applying lessons from site specific projects in developing a PES programme. The report concluded that the current the lack of a buyer for the services made it unviable in the short term, but that it remains a very real option in the medium to long term.

In summary, the potential for market mechanisms to sustain resource management have been acknowledged and considerable investigation has been undertaken in the study area, albeit that they were limited to PES system.

---

[24] Generally, an economic instrument can be defined as: "Any instrument that aims to induce a change in behaviour of economic agents by internalizing environmental or depletion cost through a change in the incentive structure that these agents face (rather than mandating a standard or a technology) qualifies as an economic instrument" (Panayotou, 1998). Anderson et.al. (2001) also suggest the following definition: “An economic instrument for managing the environment is a policy or combination of policies that provide financial and other inducements so that users of natural resources pay for the social costs of that use”.

[25] Maloti Drakensberg Transfrontier Project. Payment for Ecosystem Services: Developing an Ecosystem Services Trading model for the Mweni/Cathedral Peak and Eastern Cape Drakensberg Areas. Mander (ed), Institute of Natural Resources Report IR 281. Development Bank of Southern Africa, Department of Water Affairs and Forestry, Department of Environmental Affairs and Tourism, Ezemvelo-KZN Wildlife, South Africa.

[26] Zunckel, K. 2012. Supply chain management for payment for ecosystem services in the upper uThukela and Umzimvubu Catchments: PES Brokerage in the Upper Uthukela. Report to SANBI Grasslands Programme.

Expanding the Scope of Options for Incentivising Improved Management

The consideration of economic instruments formed an entire work stream (workpackage 3) within the Afromaison project due to the importance identified in plugging this gap in the current INRM practice. The Afromaison approach builds on the existing understanding and effort in the Upper Thukela by expanding the investigation beyond PES. The work was broken down into three main areas:

i. The initial focus was on establishing a broad understanding of the concept as a whole, categorize the types of instruments available and describing the strengths and weakness of each.
ii. The second phase involved the development of a tool to guide the selection of appropriate economic instruments from the broad suite of options,
iii. A second tool was established that provides guidance in designing the tool to fit within the presiding social, economic, governance and biophysical context.

The approach and outcomes of this workpackage within the Afromaison project are detailed in a specific report[27], and are summarized below.

- Developing an Understanding of Economic Instruments

An international review of economic instruments was undertaken as basis for provide a broad understanding of the types, uses, focus and factors affecting the success of various instruments. The suite of instruments included in and applied in the Afromaison Project is not a complete inventory, but rather focuses on those that were likely to have the greatest relevance as incentives for INRM. The instruments selected for the Afromaison context were clustered into three categories, each of which is made of multiple groups of instruments.

- Price based instruments (7)
- Rights based instruments (2)
- Legal, voluntary and information based instruments (5)

Two page summary sheets were compiled for each of the instruments. These included a description of the tool, discussion about the context within which it is likely to be most successful and examples or case studies that demonstrate its applications. These summary sheets serve as a useful tool to understanding different instruments.

- Selecting a Suite of Appropriate Instruments – The Decision Support Tool (DST)

The effectiveness of an economic instrument in acting as an incentive for improved environmental management is not determined by the value of the benefit (incentive) alone. There are a range of factors that will influence the effectiveness of an instrument in a specific context, and key examples of these include the extent which the instrument:

- matches or aligns with the social, political and economic contexts

[27] Lewis, F. Zunckel, K and Waldron, S. 2014. Selecting and Designing Economic Instruments to Incentivise INRM: A South African Case Study. Report to Afromaison, a project funded under the Seventh Research Framework of the European Union. Institute of Natural Resources, Pietermaritzburg, South Africa.

- relates to the nature of the environmental challenge and its causes
- is perceived as an incentive by the target agents or institutions whose behaviour or management approach is being changed

Furthermore, in developing countries in particular where financial resources are typically scarce and there is limited institutional capacity, important criteria for selecting the best economic instruments also include:

- cost-effectiveness and administrative feasibility
- consistency with other development objectives
- equity, flexibility and transparency

A Decision Support Tool (DST) was developed to assist in identifying the most appropriate economic instrument for the relevant context based on social, economic, market and governance criteria. The DST tool can be found at http://www.afromaison.net/eco_dss/DS_tool.html. Importantly the DST is applied taking into consideration the stakeholder groupings whose behaviour needed to be changed (via the application of a single, or a suite, of economic instruments), i.e. address the cause of the issue. For example, interventions to address the management of uncontrolled fire and invasive alien plants in the WHS required incentives to target changing the behaviour of adjacent communities, private farmers and tourism operators as runaway fires have originated from all these areas in the past.

The outcome of the DST process for each of these interventions is provided by way of the summary table which outlines the relative scores that the Economic Instruments obtained per intervention and target stakeholder grouping. The tables also present the score that each instrument obtained per category (i.e. environmental criteria, social criteria, market/economic criteria and governance criteria,) which provides insight into the potential strengths and weaknesses of the instrument. The last column of the table provides an un-weighted overall score for the instrument (i.e. across all four criteria categories). These tables are provided in the main report. The application of the tool resulted in the prioritization of a suite of tools for the different management zones. The example of the World Heritage site is provided as an example.

World Heritage Site – The primary issue or problem that is faced by the World Heritage Site management authority was articulated as “Threats to biodiversity and ecosystem functioning (especially catchment and watershed functioning)”, and the key drivers were as follows:

- uncontrolled and unplanned fire (inability to control fires particularly entering from neighbouring areas);
- overgrazing by livestock (cattle) entering from neighbouring areas;
- soil erosion due to lack of trail maintenance, paths by tourists (hiking trails)and criminals (illegal trade, stock theft, ad hoc burning), burning of trace lines for fire breaks; and
- alien invasive plants (spreading from neighbouring areas as well as from within the WHS)

A review was then undertaken to highlight those instruments that were most consistently highlighted as having the potential to address a wide range of interventions across the WHS and address a wide range of stakeholders. It was concluded that the suite of five Economic Instruments, outlined in Table 11

below, could collectively incentivise the implementation of the priority interventions by relevant stakeholders in the WHS.

Table 11:Summary suite of economic instruments considered most appropriate for incentivising the required NRM actions in the World Heritage Site (WHS)

Challenge	Interventions	Economic Instruments With Potential to Create Incentives
Threats to biodiversity and ecosystem functioning in the WHS	Grazing management	i. Strengthen Use Rights ii. Environmental Subsidies iii. Environmental Certification (Labelling) iv. Payment for Ecosystem Services (PES) v. User Charges
	Fire management	
	Rehabilitation and erosion control	
	Control invasive alien plants	
	Protection of high value ES areas	
	Law enforcement and permitting	

Design of Economic Instruments Selected for the Case Study

A total of nine Economic Instruments were highlighted through the DST as having the potential to create incentives for stakeholders to implement interventions addressing priority environmental challenges across the management zones (Table 12).

Table 12:Economic instruments highlighted for each zone through the application of the Decision Support Tool

Economic Instrument	World Heritage Site (Zone A)	Communal Tenure Areas (Zone B)	Private Tenure Areas (Zone B)
Payment for Ecosystem Services	X	X	X
Environmental Subsidies	X	X	
Strengthening Ownership Rights		X	
Strengthening Use Rights	X	X	
Voluntary Environmental Agreements		X	X
Tax Differentiation			X
Environmental Certification	X		X
User Charges	X		
Tradable Permits and Quotas		X	

The specific design of each instrument varies depending on the local context in terms of location, stakeholder groups. The effective implementation depends on whether or not these challenges can be addressed. To assist in identifying these flaws and challenges, the Design Matrix or 'DeMax Tool' was developed and applied in a series of stakeholder workshops. The tool, along with an introduction and guidelines for its application, can be downloaded[28].

[28] http://www.afromaison.net/index.php?option=com_content&view=article&id=85&Itemid=185.

The DeMax prompts users to analyse and determine if a series of condition criteria are likely to be met, and to evaluate the relevance of the criteria to the context. Notes on the local responses to the condition criteria are indicated in the DeMax, and anticipated problems that might limit local implementation of the instrument are flagged. These flagged issues are summarised into a list that can then be used to guide the revisions that would be required to effectively implement the instrument and create the required incentive. It also assists in identifying requirements that need to be in place for implementing them, for example: implementing a Payment for Ecosystem Services (PES) system in a WHS requires a suitably mandated and capacitated government agency. The main report highlights the challenges faced in implementing the interventions selected for each of the management zones given the specific context. The challenges faced in implementing these tools are summarized in Table 13.

Table 13: Summary of the Impacts and Sustainability of the Economic Instruments

Instrument	Impact	Sustainability
Payment for Ecosystem Services (PES)	Potentially significant impact socially and ecologically as long as all opportunities are realised and benefits stacked	The rigorous process that is needed to culminate in PES agreements will ensure that they are sustainable, as long as the stacked benefits are of sufficient value to exceed the costs of guaranteeing delivery of the services
Environmental Subsidies	Current evidence is that in many cases the implementation of subsidies is not leading to the achievement of either the environmental or socio-economic objectives. Subsidies are frequently treating the symptoms of the environmental problems rather that the underlying causes and therefore not providing a long term improvement in the conditions. In addition they are leading to increasing dependence levels of those benefitting from the subsidies when implemented among rural poor communities, at the risk of increased poverty levels in the medium to long term. These challenges could potentially be reversed if a revised approach to the implementation of environmental subsidies is undertaken.	The sustainability of the environmental subsidies is not secure as they are, in most cases, dependent on Government grant allocations. However Governments funding priorities change regularly and the source of funding to sustain the subsidies is therefore not secure or potentially sustainable in the long term. Alternative sources of funding to sustain subsidies have not been identified to date.
Strengthening Ownership Rights	While the potential impacts of ownership rights are widely reported, there are few cases of where and how it has been successfully implemented in South Africa. The social and environmental impacts of this e=instrument therefore, while potential positive and substantial, are yet not evidenced.	The sustainability of this instrument is largely dependent on the establishment of a local system to secure fair and equitable distribution of benefits within the community, and to apply and enforce the rights based approach. Given the weak governance systems currently in place and a history of conflict, there is a significant risk that the implementation of this instrument will not be sustainable in the long term, if this is not addressed.
Strengthening Use Rights	As above, the instrument has the potential to generate substantial environmental and social benefits however there is little evidence of this in a successful case in South Africa to date.	As in the case of ownership rights, the sustainability of this instrument is largely dependent on the establishment of a local system to secure fair and equitable distribution of benefits within the community, and to apply and enforce the rights based approach. Given the weak governance systems currently in place and a history of conflict, there is a significant risk that the implementation of this instrument will not be sustainable in the long term, if this is not addressed.
Voluntary Environmental Agreements	Difficulties currently being experienced with securing Stewardship agreements are testimony to the possibility of this instrument having limited impact. Unless this approach to securing sustainable and conservation compatible land management can demonstrate that the benefits are at least equal to the opportunity costs, successful application will be limited to land owners who can afford to set land aside and/or have a very strong sense of responsibility towards the natural environment	Potentially very strong as the Stewardship programme is specifically designed to have the agreements signed into the title deeds of the properties in question. However, the capacity of EKZNW to monitor implementation of the agreements and to continue supporting the land owners is very limited. Without this regular follow up and support, it is possible that land use can change with ownership, despite what is written into the title deeds

Tax Differentiation	At this point in the brief history of the KZN Stewardship Programme the promised benefits of tax rebates on property rates related to Conservation and Stewardship Agreements still need to be realised. Indications are also that when this is achieved, the size of the rebates may be insignificant in relation to the value of the opportunity costs	With the close link between this instrument and VEAs, the sentiments reflected above are relevant here as well. However, if rebates on property rates are realised, no matter how insignificant, they will at least be a tangible benefit which may contribute to the sustainability of this and VEAs as possible instruments
Certification	The FSC certification requirements imposed on the timber industry are indicative of the potential impact that this instrument may have in this area. However, even this scheme has been shown to be lacking in terms of ensuring absolute compliance with sustainability requirements. Other certification schemes in South Africa are struggling to establish themselves with only Fair Trade appearing to make some headway. The potential impact of this instrument is thus negligible unless EKZNW are able to develop a scheme that is unique to the WHS and which is allowed to evolve from Labelling	The FSC process has been able to sustain itself for at least a decade and is thus testimony to the possibilities that exist with such instruments associated with the commercial farming and tourism sectors
User Chargers	User charges are likely to be a relatively simple and system to generate additional income streams to support the necessary interventions. Once the funds are raised through the user charge, it will need to be spent on the work required. This could either occur through funding the interventions directly through the conservation authority in which case it is likely to have the anticipated ecological and socio-economic impacts. Alternatively the funds could be applied through an environmental subsidy scheme in which the risks raised under the relevant section above would apply.	The sustainability of this intervention will depend on the extent to which the price of the user charge is correctly estimated and set. If set too high it would detract from the use of the service and the user numbers could decline, resulting in inadequate fees being raised to achieve the desired interventions. If well priced it should not affect demand and could be sustained. Secondly, the capacity of the authority to administer the user charge will also affect sustainability. Given that the WHS authority currently administers and entrance fee system, it is likely to be able to extend this system to accommodate the user charge as well.
Tradable Permits and Quotas	The viability and impact of this system will be primarily driven from two perspectives, i.e. (i) the ability of the relevant authority to enforce the system and provide an equitable distribution of benefits/costs, and (ii) the availability of alternatives that create the opportunity to set the quota/number of permits at a level that meaningfully reduces the ecological pressure (without reducing socio-economic well-being of users). If these requirements can be addressed the system will generate meaningful impacts.	The sustainability of this instrument is largely dependent on the establishment of a local system to secure fair and equitable distribution of benefits within the community, and to apply and enforce the permits and quotas. Given the weak governance systems currently in place and a history of conflict, there is a significant risk that the implementation of this instrument will not be sustainable in the long term, if this is not addressed. Secondly the sustainability will also depend on the ability of the market to sustain the access to sustainable alternatives that are used to create the opportunity to set a reduced level of resource use, relative to current use levels.

Benefits for Integration

Both the DST and DeMax processes proved time consuming and required that the stakeholders invest adequate time and effort into the exercise. The outcomes however are considered to justify this investment. For example, initial impressions were that Environmental Subsidies are an effective instrument as they are already being widely applied in the case study. However, interrogation through the DeMax process highlighted a number of critical flaws in its current application. A primary issue is the non-sustainable nature of Environmental Subsidies due to unstable and irregular funding. As an example, beneficiaries left permanent employment to work on resource rehabilitation projects due to higher pay. They took on more debt on the basis of the increased income, only to be left unable to service this debt when the funding ran out – leaving them in a worse situation than previously.

It was only as a result of the stakeholder discussions and interrogation of the criteria in the DeMax that these challenges and flaws in the current or potential implementation of Economic Instruments in the South African case study were highlighted. This information provided the critical insight required to ensure that the best instruments are selected, and their design is appropriate to the local context so that the instrument is compatible with the target intervention required to improve NRM.

Furthermore, the stakeholder and expert debates, fuelled with the outcomes of the DST and DeMax processes, also highlighted the need for clustering and staking of Economic Instruments to holistically create the inventive required for the interventions. In most cases, there is not a neat one-on-one relation between a single intervention and a single Economic Instrument. This type of implementation would be too resource- and management-intensive.

- Clustering therefore involves the identification of a single or cluster of instruments that together collectively provide the incentives needed to implement the suite of interventions required to address the priority environmental challenges in a meaningful scale in a particular zone or area (e.g. meso-scale).
- It may not be possible for a single Economic Instrument to generate a sufficient scale of benefits to incentivize the interventions required. In this case, a multitude of instruments could create benefits which, when stacked, collectively create the scale of benefits necessary for a meaningful incentive that brings about the required change in behaviour of target stakeholders.

The analysis and review processes facilitated by the DST and DeMax assisted the identification of both the clustering and stacking requirements as well as the opportunities. So in conclusion, while the DST and DeMax tools required a significant commitment from stakeholders, they facilitated a level of interrogation which has not previously been undertaken in the selection of Economic Instruments. The two tools have therefore provided new insights into the potential that Economic Instruments can play in local natural resource management initiatives, and informed the selection and potential design of a range of Economic Instruments that could be applied in the case study.

5.4.3 Establishment of Indicators as the Basis of Long Term, Adaptive Management

It was reported that Monitoring and Evaluation is a massive gap across the majority of NRM activities in the UDM. The lack of a monitoring and evaluation (M&E) programme limits the ability to understand whether management actions are being successful over time and adapt accordingly. This may result in a waste of resources where a specific action is failing.

Development of Indicators

The Afromaison NRM strategies for the various management zones within the district identify and prioritize actions and interventions across the short, medium and long term. Assessing success of the strategies over time allows for actions to be changed or adapted where they are not proving successful, or enhanced where they are. In order to measure success it is necessary establish a monitoring and evaluation programme (M&E). Such a programme includes a hierarchy of elements that are used to measure and reflect change either way. Indicators are an important element of the monitoring system as they provide the mechanism through which evaluation of change against objectives and targets can be measured.

A set of indicators was developed as part of the INRM strategy developed for the Uthukela District as part of Afromaison project. Given the ESs foundation to the framework, the indicators reflect the change in the condition of natural systems as a surrogate for monitoring the change in the supply of the important ecosystem services identified for the district. Indicators are provided at a landscape or catchment scale through which change can be monitored on long term basis.

Importantly, monitoring and evaluation techniques have also been developed for the site specific scale to assess improvement in the condition of the restored systems in a shorter time scale. This is an important addition because the findings of the site monitoring are required to:

i. The feedback from the site scale provides the basis for processing transactions associated with financial mechanisms such as Payment for Ecosystem Services (PES), i.e. buyers of the ecosystem services will only pay if there is proof that the service is being delivered, which is demonstrated by improvements in condition of the resources and their capacity to reduce sedimentation, improve diversity of species and productivity of grasslands, etc. Evidence from the catchment scale indicators is too infrequent (5 years) to support such transactions.
ii. Allow for comparison between site scale monitoring and landscape/catchment level evidence. Such a comparison will indicate whether, if successful, the site specific efforts are extensive enough to be registering improvements in ecosystem functioning and service provision a landscape or catchment scale. This analysis will inform whether or not scale up the extent and resources allocated to a particular priority management area.

The site specific monitoring requires evidence gained from on the ground monitoring, preferably undertaken by the local beneficiaries or role-players involved in such financial arrangements. The monitoring programmes developed by the University of KwaZulu-Natal for areas under rural tenure in the Drakensberg are a very good example, and provide a useful for tool for replication across the similar landscapes and socio-economic context. The UKZN work provides guidance on the techniques, the institutional set up, training and reporting[29]. They also provide an indication of the costing models related to implementing such a monitoring programme. The monitoring techniques employed focussed on both biological and physical and biological indicators and associated monitoring techniques (see photos of examples):

- Splash boards (to measure the height of splash)
- Morgan splash Cup (measure the up-down slope erosion)
- Donga profile (to measure sediment deposited)
- Plant basal cover (to measure how much soil is covered by vegetation)
- Rain Gauges (to measure rainfall in each sub-ward)
- Run –off plots (to measure water quality and quantity on slopes).
- Gauging weirs (to measure water quantity from catchments).

[29] Everson, T.S, Everson, C.S and Zuma, KD. 2007. Community based Research on the influence of rehabilitation techniques on the management of degraded catchments. Report to the Water Research Commission.

Photo 1. Monitoring Donga Profiles

Photo 2. Square metre run-off plots are installed in the ground and connected via a plastic pipe to a two litre coke bottle. All water run-off from the plot is collected in the bottle and measured as water quantity. The depth of silt rom the plot is also measured as an indicator of water quality.

This idea of involving local people in managing and monitoring their environment, particularly where they are directly reliant on/or affected by it gives effect to and entrenches the fact that natural resource management is a shared responsibility. An excellent example of the transfer of capacity and responsibility to society at large to monitor the health of the systems in which they live is how the miniSASS[30] tool for assessing river health and submitting results to a central repository for use in catchment management (http://www.minisass.org/en).

Governance Indicators

Natural Resource Management is a shared responsibility. The effective involvement of all relevant role-players which requires them taking responsibility for their specific role in achieving agreed objectives is essential if any strategy is to be implemented. Given the importance of effective governance, it is important to assess whether different role players are:

- Involved (attending meetings and implementing actions)
- Are contributing to decision making and fulfilling their role/potential in implementing NRM actions.

Indicators are therefore proposed in the INRM framework for monitoring the level of involvement by the full suite of role-players in developing and implementing the NRM strategy. While stakeholder involvement is only one aspect of governance it is an important first step and relatively easy to monitor. The indicators can be developed further once there is better understanding of the institutional structure. The landscape level and governance indicators are summarized in Tables 14 and 15.

[30] P.M. Graham, C.W.S Dickens & R.J Taylor. 2004. miniSASS — A novel technique for community participation in river health monitoring and management. African Journal of Aquatic Science, Volume 29, Issue 1, 2004

Benefits for Integration

Indicators enable integration of management across time scales as they facilitate an assessment of the success of management interventions. By adjusting the management focus it is possible to allocate resources more effectively.

Challenges to Implementation

These indicators presented relate to the supply of services and the following limitations should be noted:

- Ideally a suite of indicators is required that also indicates change in the demand for services as significant shifts in demand may result in a change in the focus of management. As an example, the development of a new large scale storage dam would elevate the importance of streamflow regulation from the catchments that supply this new infrastructure. It is therefore recommended that a review of the ES analysis, including the data used to determine demand is undertaken on a 5 yearly basis.
- It is difficult to establish effective indicators that measure whether the change in condition of the natural systems is being converted into a tangible increase in the level of supply delivered to the users, i.e. the socio-economic benefits such as improved productivity from land, increased visual appeal and associated attraction value to tourists. The assumption that has been made is that, if the targeted systems in the priority areas are improving in condition that the users are benefitting because they were factored into the demand that informed the prioritisation. In view of this limitation, the identification of appropriate indicators and measures of socio-economic benefit from improved ES supply is recognized as an area which requires additional research.

A further challenge is that there is a cost associated with training people to implement monitoring programmes, and then sustain these on a long term basis. This financial demand reinforces the need to develop economic instruments that can meet this need. This is why the inclusion of economic instruments as incentives in the Afromaison framework is key to supporting the essential requirement that INRM has a long term focus.

Table 14: Indicators for monitoring NRM success at a landscape scale

INRM SUCCESS INDICATORS						
System	Criteria	Indicator	Target	Measure	Data Source & Method	Notes/ Assumptions
Natural Systems						
Water Resources	Quality	Capacity of large storage impoundments .	Decrease in the rate of reduction in dam capacity	Rate of decline in dam capacity measured as % of total capacity/per year. Change measured at frequency of 5 years (annual too small a period to note changes).	Hydrographic survey undertaken by DWA Directorate: Spatial and Land Information Management (Reference: http://www.dwaf.gov.za/bi/services.htm)	If the aim is to manage strategic catchments at a large scale (across the entire landscape and variety of land-uses, e.g. communal and commercial). If this takes place then success should be reflected in a decline in the rate of reduction of large dam storage capacity. As erosion is a natural process and affected by variations (particularly in rainfall), the best one can hope for is a decline in the rates over time, i.e. cant set specific target such as 10% reduction over 10 years. This indicator reflects changes in 'Soil Retention Service'
		Turbidity levels	Decrease in annual average turbidity levels.	Change in average annual turbidity levels (NTU). Change measured at 5 yearly interval (annual too short a period to account for natural variation)	Measurement at inflow points to large dams using a clarity tube and measured in cm. Undertaken by DWA officials as part of daily management (this may be too onerous). Alternatively, a local resident living at the inflow is employed to take record.	This indicator supplements the understanding of change generated from the above indicator. I t also reflects the change in the 'Soil Retention Service' over time.
	Quantity	Streamflow	Improved streamflow regulation	The change (reduction) in the differential between high and low flows.	DWA flow data from gauging weirs and any other sources (research projects, or water user associations). The data should also be modelled to bring the resolution closer to the point of change.	The rationale for this indicator is that a reduction in the differential between summer and winter flows indicates an improvement in the capacity of the land to slow, retain and release, i.e. regulate, streamflow. While the change needs to be analyzed on an annual basis, long term monitoring is required to establish confidence in trends.

Land Resources	Condition	Degraded land	Improved trend in condition of land	Total area of land (ha) classified as degraded	Provincial land cover compiled by EKZNW – updated on 5 yearly frequency	May need to choose and lump several land classes, e.g. eroded land, degraded land. Or report on each individually. This indicator relates to suite of services that depend on condition of grasslands (water regulation, biodiversity, tourism, etc.)
	Productivity	Yield	Increased yields	Tons/hectare/annum	Farmers Associations	Yields from areas where crops are produced annually naturally decline over time due to reduced productivity of soils. Yields are only maintained through increased fertilizer application and technology (e.g. GMOs). Over the long term even these inputs will not sustain increased yield without proper soils management, i.e. no-till/rest years, etc.) . So an increase would suggest benefits of good soils management in the long term. This is an indicator of the 'production value' generated by a combination of soils, climate, etc., i.e. it is not a ES per se.
		Production cost	Decline in fertilizer costs OR volume for staple crops - maize.	R/Ha OR Tons/Ha	Individual farmers/Associations	Reduced fertilizer inputs are a direct financial benefit of conservation farming techniques (excluding initial capital costs for required machinery). One cant just use overall production costs because these are affected by other variables like fuel and labour costs. The change in volume is probably the better measure as costs varies based on other drivers (transport, etc.).

	Biodiversity	Conservation target	All CCA1 areas conserved.	% of CCA1 areas under formal protection (NR, Stewardship, etc.)	EKZNW – GIS analysis on 5 yearly basis (overlay CCA areas with PA coverage – both formal and stewardship sites, etc.). It will be important to define the target areas at a point in time since destruction of habitat elsewhere influences the target for remaining habitat, i.e. there is a need to avoid shifting goalposts	This indicator relates to "Habitat and maintenance of Genetic Diversity".
		Condition	Improved condition of habitat.	NDVI status for grasslands	NDVI analysis – undertaken on 5 yearly basis. This area of grassland to be analyzed will need to be defined in time as woody plant encroachment and alien invasives are reducing the overall extent of grasslands and will have a very different spectral signature in the NDVI. Specific thresholds will need to be determined for NDVI scores against which to measure status.	Improved NDVI provides a broad indicator of grassland condition – indicating appropriate grazing/stocking and fire management. This relates to "Habitat and maintenance of Genetic Diversity" as, at a very broad level, the better the condition of habitat, the better the diversity. This indicator should be supplanted with findings from surveys on rehabilitated areas because of the limitations of the NDVI approach, i.e. increased basal cover does not necessarily mean an improvement in diversity. I t is important to consider this indicator in conjunction with the one above because securing areas for conservation does not mean that he habitat is maintained in an appropriate condition.
		Resource allocation	Increased allocation of resources to NRM	Annual change in budget allocated to resource management (fire, alien clearing, erosion control, grazing management).	EKZNW and NRM Programmes (national and provincial) -and any other partners (NGOs)	Analysis of change needs to account for inflation, with consideration of key factors on affecting cost, e.g. diesel and labour. This is an additional to that above, to provide understanding as to whether adequate resources are being applied to management of biodiversity priority areas, both within and outside PAs.

Table 15: Indicators for monitoring NRM success at a landscape scale

GOVERNANCE SYSTEM						
System	Criteria	Indicator	Target	Measure	Data Source & Method	Notes/ Assumptions
Decision Making	Representation	Stakeholder representation/ participation	Attendance of representatives from all stakeholder groups at all meetings/ contribution to decisions.	100% attendance of representatives from all stakeholder groups at all meetings/ contribution to decisions.	Minutes of meetings and attendance registers.	It is very difficult to measure the level of contribution by stakeholders to decisions. At the moment the lack of involvement by all stakeholders in coordinating forums makes a 'representative' decision almost impossible. The first step is therefore to establish such forum/s at which all stakeholder groups are represented the majority of the time – particularly civil society, private sector and communities – (government officials are often mandated). If these stakeholders are represented it will indicate at some level that they have trust in the forum, that their input is being heard and valued, and that decisions are being taken. Lack of all these aspects are some of the key reasons for the failure of certain existing forums to achieve co-ordination and long term participation by stakeholders, e.g. catchment management forums
Implementation	Resource allocation	Budget allocated to INRM	Increase expenditure	R/annum allocated to INRM activities (split between protection and rehabilitation)	NRM project annual reports	Current expenditure is inadequate to halt never mind reverse loss (acknowledging that it could be spent more efficiently). An increase is INRM budget allocation is therefore required. The resource allocation needs to be considered against the biophysical indicators to establish whether the level of resources is sufficient to make a difference at a landscape level.
		Co-ordinated action	All NRM programmes co-ordinate planning and implementation	Spatial focus of provincial and national programmes in priority areas identified in DM.	NRM programme annual reports (maps)	Need to report on expenditure in terms of implementation and monitoring. Relates to all ES selected by these programmes.

5.5 Effective Stakeholder Engagement

The majority of legislation governing natural resources management demands or requires stakeholder involvement. The National Water Act provides a good example. Rogers and Luton (2011)[31] explains that "integrated water resources management (IWRM) is a legal imperative in South Africa at the catchment scale" and that catchment managers must "strive to implement coordinated and cooperative participatory management that ensures water resource use is sustainable, equitable and efficient. Rogers and Luton (2011) further maintain that, given that "Catchments are complex systems their management requires diverse stakeholders to generate a shared understanding of the system, and engage in consensus driven decision making and cooperation towards shared objectives".

The continuum of stakeholder involvement extends from participation (where stakeholders are informed and comment) through the most developed level were stakeholders actually play a role in in decision making, such as setting the management class for a water resource. In practice however consultation rarely extends beyond participation, despite the governance framework suggesting that greater involvement is required if it is to give meaningful effect to users rights and the intention of the law. NRM can only be integrated if stakeholders are effectively engaged.

Afromaison Approach – Diverse and Ongoing Engagement

In recognition of the need for effective engagement (where stakeholders contribute to a shared vision and how to get there), a range of methods were employed in stakeholder engagement over the duration of the project in moving from an integrated understanding of these systems to an integrated natural resources management strategy. A chronological summary of the engagement process is provided in Table 16 which also presents the objective of each engagement element, the timing and outcomes.

[31] Rogers, K.H. and Luton, R. 2011. Strategic Adaptive Management as a Framework for Implementing Integrated Water Resources Management in South Africa, Water Research Commission Report No: KV 245/10. ISBN 978-1-4312-0010-8.

Table 16: Chronological summary of the Afromaison stakeholder engagement process

PURPOSE	ACTORS INVOLVED	MAIN CONTENTS OF THE STEPS	SUBSTANTIVE OUTCOMES	OUTCOMES – SOCIAL LEARNING & RELATIONSHIPS
Preliminary Stakeholder Engagement [March-November 2011] Reference: WP2 SA Case study report.				
Establish a preliminary understanding of the INRM context in terms of: spatial and other data documenting the biophysical, socio-economic and cultural status quo, governance framework, key stakeholders, the main INRM issues and drives of these.	Semi-structured interviews with representatives from a cross section of key stakeholder groups and organisations including relevant national, provincial and local government departments. NGOs working the area were also engaged.	• Introduce Afromaison project. • Collection and synthesis of desktop spatial data and information to document INRM status quo. • Interviews with key stakeholders to supplement desktop information, establish issues and drivers, and assist in developing stakeholder list.	• Stakeholder database and mapping. • Spatial overview of natural systems, and socio-economic information. • GIS baseline data which formed basis for Ecosystem services assessment and analysis. • Obtained buy in/endorsement of the project from the District Municipality and agreement to participate/ assist.	• Established a relationship with and became member of the 'Synergy group" which included key INRM actors (govt, and NGOS) operating in the Drakensberg and buffer area. • Established a good working relationship with several important actors, which was beneficial throughout the project, particularly the NGO: African Conservation Trust (ACT), whose field staff assisted throughout with engaging rural communities. • Interview process provided opportunity for actors to unpack/synthesize their understanding of the context and main INRM issues.
1st Integrated Stakeholder Workshop [17 July 2012] Reference: Workshop Proceedings				
• Entrench understanding of Afromaison project context, approach and objectives. • Update SHs on outcomes of baseline – i.e. INRM context and get feedback/verify. • Present ecosystem services approach and draft outcomes. • Present draft scenarios analysis. • Verify key INRM issues in w/shop	- Comprehensive coverage of NRM actors - Entire case study team.	• First part of the day involved the presentation of Afromaison background, the outcomes of the baseline review, the scenarios and draft ecosystem services mapping • The second half involved interactive	• Increased/refined stakeholder database. • Improved understanding of project and the INRM context.	• Established integrated understanding across range of diverse role-players. • Agreed list of NRM issues. • Broad NRM vision statements for management zones.

PURPOSE	ACTORS INVOLVED	MAIN CONTENTS OF THE STEPS	SUBSTANTIVE OUTCOMES	OUTCOMES – SOCIAL LEARNING & RELATIONSHIPS
process. • Based on above, establish broad Vision for Management Zones across the District.		process to verify the key issues and drivers and development of vision for management areas.		
Monitoring of stakeholder planning and consultation process [April 2012-October 2012 [Stakeholder process Analysis Report]				
Assess the effectiveness of the consultation process in increasing SH awareness/capacity in terms of INRM, and the contribution to the project deliverables.	• M Pommerieux (Masters Student-Researcher). • Key stakeholders.	• Interviews with key SHs prior to 1st SH workshop. • Analysis of Pre and post Workshop Questionnaires. • Post W/shop interviews with key stakeholders. • Integrated analysis consolidated in report [Ref32.	• Analysis of levels of stakeholder understanding of NRM, context, issues and perceptions regarding change.	• Valuable insights for study team in terms of understanding regarding the INRM concept, the need for integration and attitude towards change in their approach, habits, involvement with other role players.
WAT-A-GAME: Development and Application [May 2012-Nov 2013] Reference[33]: Integrated Game summary & individual Game Reports.				
• Establish an integrated understanding of I NRM issues across role-players. • Test the INRM strategy or components thereof.	• The game was developed with students from University of KZN and • The game was run with representative from a cross section of role players (6 games in total – see report). • The game was used to test the institutional structures considered appropriate to	• Development of game with study team, synergy group and students (Oct 2012-Jan 2013). • Running the game in 6 sessions (Feb-July 2012). • Testing the institutional options for implementing the strategy	• More in depth understanding of the specific INRM issues and challenges and drivers of these. • Spatial focus of key issues in the Okhahlamba Local Municipality. • Guidance on the	• Improved understanding amongst different role players of the issues faced by other stakeholders in times of resource scarcity and/or challenges faced by government in performing their mandate – due to playing roles other than their own. This shows the value of "putting oneself in another's shoes".

[32] Pommerieux, M, 2012. MONITORING AND EVALUATION OF A PARTICIPATIVE PLANNING PROCESS FOR THE INTEGRATED MANAGEMENT OF NATURAL RESOURCES IN THE DRAKENSBERG AREA – SOUTH AFRICA. A report submitted after a six-month internship in fulfilment for the degree of MASTER IN ENVIRONMENTAL SCIENCES AND POLICIES Of SCIENCES PO And UNIVERSITE PIERRE ET MARIE CURIE

[33] S. Waldron. 2013. Afromaison Workpackage 7: Role Playing Game Final Summary Report. Institute of Natural Resources.

PURPOSE	ACTORS INVOLVED	MAIN CONTENTS OF THE STEPS	SUBSTANTIVE OUTCOMES	OUTCOMES – SOCIAL LEARNING & RELATIONSHIPS
	implement the INRM strategy. This involved a select group of stakeholders [see report].	(19 November 2013).		
Workpackage 3 and 4 Technical Workshops [May 2013-October 2013] References are WP 3 case SA study report[34] and WP 4 report[35]				
Develop, refine and test the tools for these WPs.	• Stakeholders with specific technical knowledge and experience in the District. • Relevant WP members of study team.	• Series of workshops at which the draft tools developed by the study team were presented to SHs. • Refinement of tools based on inputs from SHs and testing. •	• WP 3 Tools: Document summarizing range of sustainable land management interventions for the District and guidance on selection for different socio-economic and biophysical contexts. • WP 4 tools: Decision support tool (DST) and Design Matrix tool (DeMax)	• Improved understanding amongst SHs regarding the various management options and economic instruments.
Final Integrated Stakeholder Workshop [18-19 October 2013] Reference: Proceedings of the Afromaison SH Workshop]				
i. Obtain acceptance from SHs of the broad elements of the INRM strategy. ii. Refine the strategy for each of the management zones. iii. Define appropriate institutional structures and mechanisms to facilitate implementation of the strategy.	• Broad cross section of SHs. • Case study team	Day 1 • Summarize the aims, objectives, approach and benefits of the Afromaison approach. • Present progress and outcomes of each element. • Obtain input	• SH input and acceptance of the broad approach, tools and outcomes (with request for some changes). • Detailed strategies for specific management zones. • Insights into the strengths and benefits of	• SHs given some level of ownership of the strategy. • Useful opportunity for SHs to collectively identify the factors required to achieve institutional co-ordination and to define the necessary structures.

[34] McCosh, J, Dickens, J and Johnston, R. 2013. Sustainable Land Management Interventions for the Uthukela District Municipality. Report to Afromaison, a project funded under the Seventh Research Framework of the European Union. Institute of Natural Resources, Pietermaritzburg, South Africa.

[35] Lewis, F & Zunckel, K. 2013. Selecting and Designing Economic Instruments to Create Incentives For Improved Natural Resource Management A Case Study in the Upper uThukela District, South Africa. Prepared for Afromaison Project, Institute of Natural Resources NPC.

PURPOSE	ACTORS INVOLVED	MAIN CONTENTS OF THE STEPS	SUBSTANTIVE OUTCOMES	OUTCOMES – SOCIAL LEARNING & RELATIONSHIPS
		on approach and broad outcomes • Workshop specific strategies for defined management zones. Day 2 • Finalise specific strategies for defined management zones. • Review existing governance structures as basis for defining most appropriate structure for implementing the strategy.	different existing institutional structures – to inform development of optimal structures.	

Strengths of the process were considered to be:

- Ongoing engagement – Stakeholders were involved several times in various ways in relation to different aspects of the project which built their capacity, allowed them to become familiar with the project objectives, INRM terms and concepts which enabled them to participate more effectively.

- Integration of stakeholders – apart from the large integrated stakeholder workshops, many stakeholders were involved in several other processes so that they became used to engaging with other stakeholders which contributed to a shared understanding.

- Range of engagement techniques – Emphasis was placed on using a range of techniques during the engagement process that effectively involved stakeholders, i.e. their involvement was participative, rather than passive. Examples include the WAT-A-GAME and the participative mapping illustrated in photos Figure 23. The development of the integrated strategies was particularly participative. It involved stakeholders developing the integrated strategy by using cards representing the various elements, to assign the most appropriate management interventions and economic instruments for addressing the key issues and drivers across the short, medium and long term. Cards representing role-players (responsibilities) and challenges to implementation were also allocated. The relationships between activities and roleplayers were made with string Figure 24).

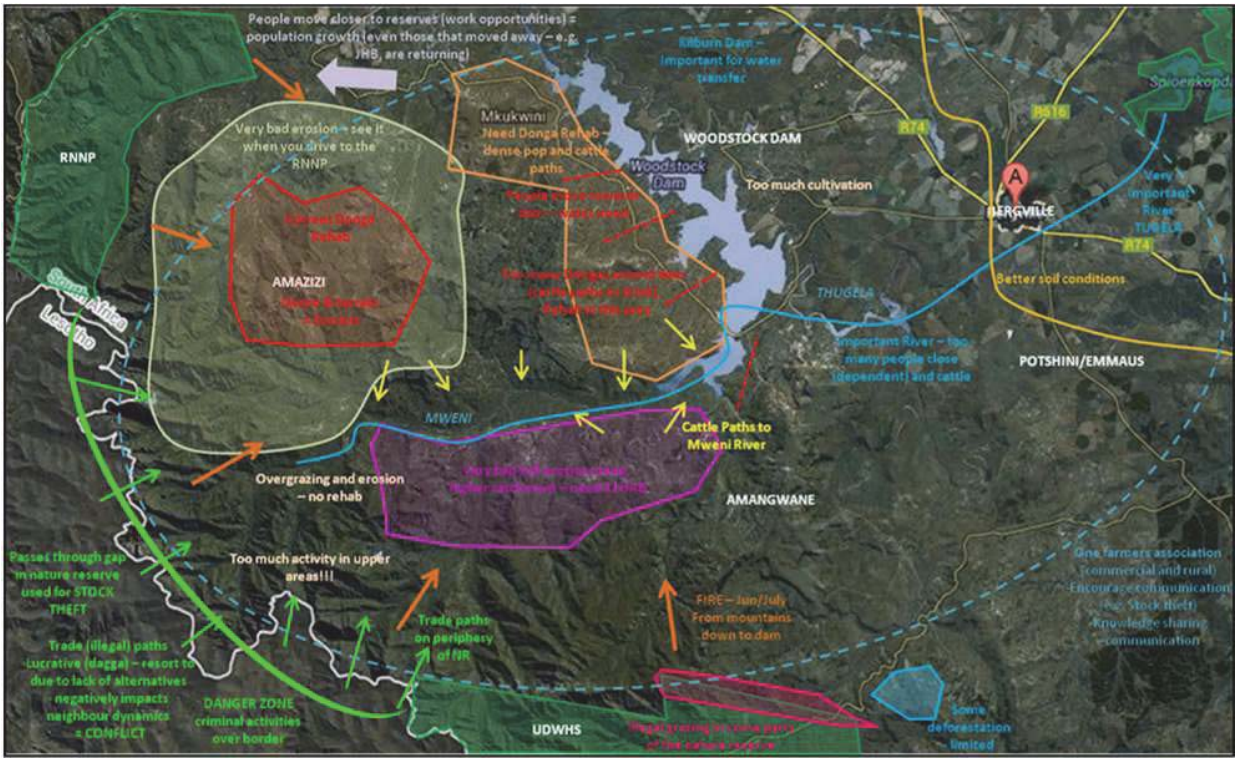


Figure 23: Outcomes of participative mapping with stakeholders and photos showing WAG in process.

Photos showing the WAG in process

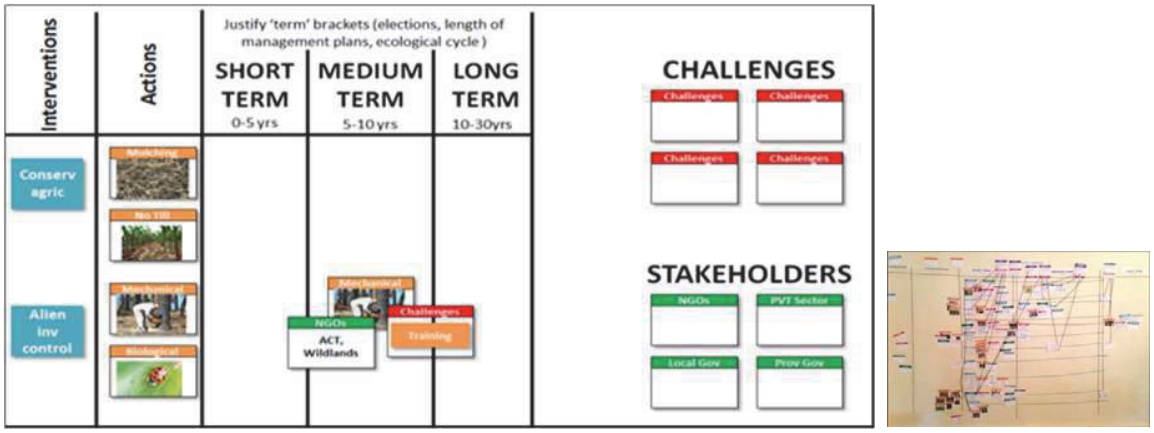


Figure 24: Strategy structure populated in interactive manner with stakeholders for each management zone

Benefits for Integration

The integrated approach and use of alternative methods in ensuring real involvement by a diverse range of stakeholders extended to the development of the final strategy. Overall, the process highlighted the value and importance of stakeholder engagement rather than just superficial participation, and of using alternative and innovative methods for facilitating involvement across the broad spectrum of stakeholders from rural isiZulu speaking communities to commercial farmers. While it is acknowledged that such participation adds a cost – it is argued that the efficiencies in management achieved through an integrated understanding and subsequent collaboration in working towards agreed management vision ensures that this is valuable investment. Furthermore, once a base understanding is established, the resource inputs required going forward are less significant if the interaction and participation is maintained through collaborative implementation of the strategy as it will further build capacity and a common purpose.

6. THE INTEGRATED VALUE OF THE INRM FRAMEWORK

The previous chapter has presented the motivation for each of the five elements promoted by the Afromaison approach as being essential for entrenching 'Integration' across scale, time, different resources, and stakeholders within the governance framework so that it becomes common practice as opposed to best practice. These five elements are summarised in Table 17.

Table 17: Five key elements for improved integration in NRM practice

1	Ecosystem services approach and methodology for mapping
2	Meso-scale
3	Appropriate Institutional Structure
4	Long term Focus - Treating the symptom and the cause - Economic instruments to serve as financial incentives - Indicators to inform monitoring and evaluation
5	Effective stakeholder engagement

This chapter summarizes the value of these elements in combination within an integrated strategy summarized in figure that indicates:

- Where to manage – integration across scale.
- When – integration over time.
- Who – integration of stakeholders with actions over time.
- What – dentification of drivers and impacts, what management interventions are appropriate to address the impacts, and what economic instruments may serve as appropriate incentive to sustain management in the long term. The 'what' also extends to the indicators required to monitor management effectiveness over time.

The following discussion summarizes how each element contributes to the development of the INRM.

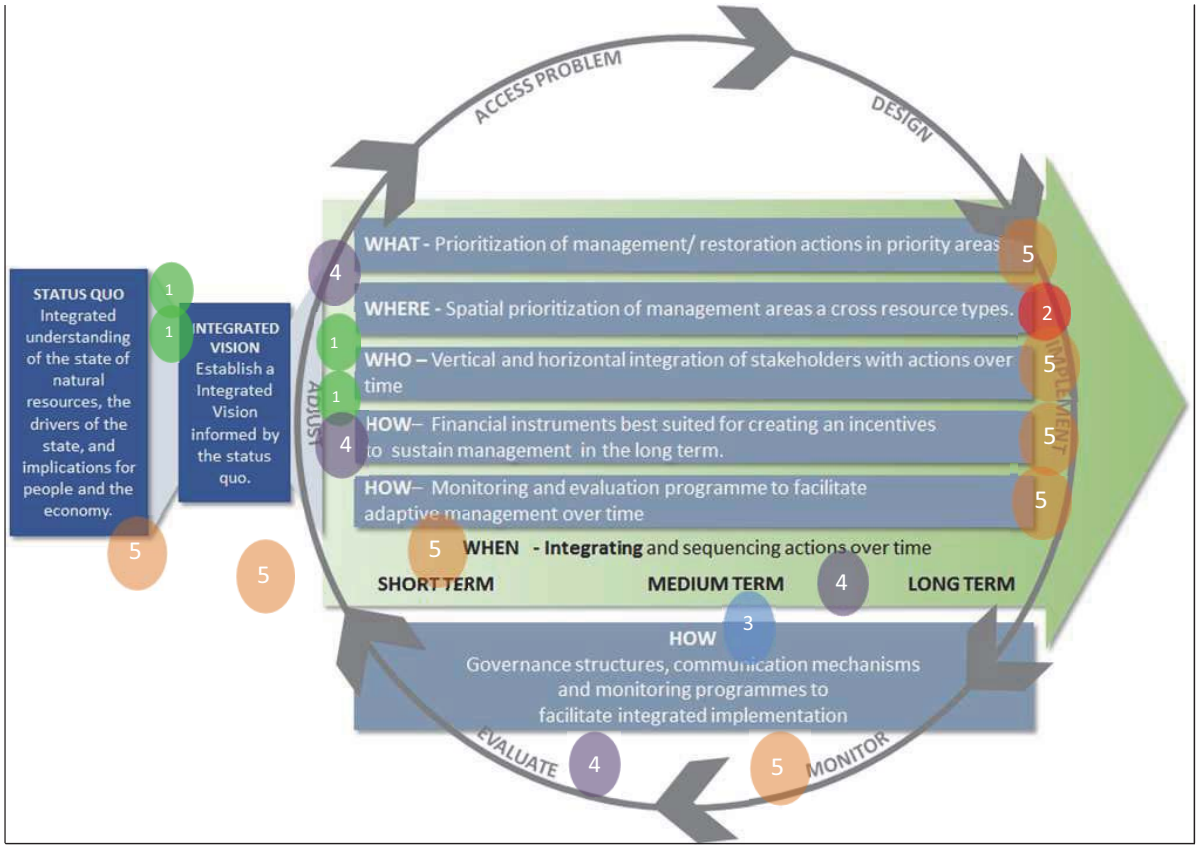
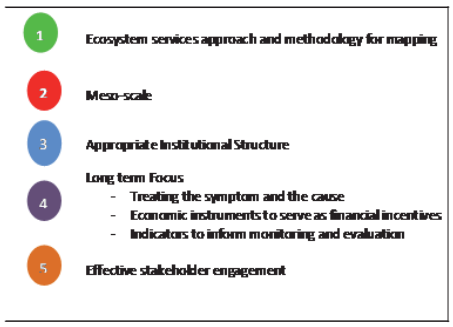


Figure 25: Integrated Natural Resources Management Strategy

Ecosystem Services

By combing demand and supply, the ES approach provides for integration between natural, social and economic systems. This integrated understanding is essential for stakeholders to appreciate the implications of management decision for other users and arrive at an integrated vision and objectives to guide management action. The ES approach also integrates:



- Across scale because it accounts for the value of the services generated within the area to external users at a regional, provincial, national and even international scale.
- Integrates across natural resources because it identifies priority management areas that need to be conserved/rehabilitated to meet services generated by range of systems.
- Integrates across stakeholders (who) by identifying who benefits from the ecosystem services generated by that system, and who therefore needs to be engaged in determining management responses.

Meso Scale

Is an appropriate sale for facilitating both vertical and horizontal integration. Importantly the ES mapping provides a useful tool to the District to inform 'upwards' and direct national and provincial government (and external funding sources) to priority management areas.

Appropriate Institutional Structure

An appropriately resourced and structured institutional structure is required to ensure coordination and implementation of the strategy.

Long term Focus

The understanding of the drivers of degraded systems allows for integrated approach to the selection of responses that provide for a more holistic and comprehensive long term response than by addressing the impacts in isolation. The indicators allow for adaptive management over time, thereby increasing the effectiveness of the strategy because it allows responses to remain valid. The identification and application of appropriate economic instruments provides the incentive and finance to sustain management in the long term.

Effective stakeholder engagement is relevant across the entire strategy. It is essential for ensuring that stakeholders develop an integrated vision, and are then informed and involved in implementing the strategy, up scaling success and amending unsuccessful responses.

7. TAKING THE FRAMEWORK FORWARD

The intention has been to develop practical mechanisms and tools that are replicable at a district level. While several of the 5 key elements are not new there are new adaptations and tools developed to support them being undertaken more effectively. The thinking regarding certain elements has also been taken forward considerably – particularly the Ecosystem services mapping at the district scale and the use of this concept as the foundation for the strategy due to it facilitating integration across different resources and overcoming the insular approach to managing in response to specific legislation.

The one element that is new is the proposed institutional structure as it seeks to cut across the linear approach and stimulate coordination and efficiency, without adding significantly to the administrative burden. The implementation of the framework depends on this structure being accepted. This requires that the structure is trialled in an appropriate test site. This trial would involve defining the structure in more detail in terms of:

- Whether it could be formally constituted in terms of NEMA in order that it has greater legal standing,
- Practical challenges of communication networks and options for including marginalised stakeholders,
- Designing the M&E programme,
- Roles and responsibilities,
- Establishing cost and whether these could be covered within existing departmental budgets, and which departments should contribute,
- Communication and reporting protocols.

REFERENCES

Afromaison. (2014). Accessed at: http://www.afromaison.net/

BEEH. (2004). SSI Research Project Thukela Basin Report, School of Bioresources, Engineering and Environmental Hydrology, University of KwaZulu-Natal, Unpublished Report.

Biodiversity GIS. (2007). Accessed at: http://bgis.sanbi.org/nsba/project.asp

Biodiversity Stewardship SA. (2009). Accessed at: http://www.kznwildlife.com/index/pho?/Biodiversity-Stewardship-SA.html

Cork. S., Stoneham. G., and Lowe. K. (2007). Ecosystem Services and Australian Natural Resource Management (NRM) Futures. Ecosystem Service Working Group, Australian Government Department of the Environment, Water, Heritage and the Arts: Canberra, Australia.

Collett, A and F. Mitchell. (2012). KwaZulu-Natal Agricultural Land Potential Categories. Internal Report: Version 1. KZN Report N/A/2012/14. Natural Resources Section, Department of Agriculture and Environmental Affairs. Cedara, Pietermaritzburg, South Africa

Cox. D. (2013). WP7 Final Synthesis and Comparison between Case Studies: Information to be Provided for Each Case Study, Afromaison, Institute of Natural Resources, South Africa

Cox. D., and Oosthuizen. S. (2013). Moving from IWRM to INRM: Contextual Review, WRC project K8/1035 Deliverable 1, Institute of Natural Resources, Pietermaritzburg.

DAEA&RD. (2010). KwaZulu-Natal State of the Environment 2004; Governance Specialist Report, Department of Agriculture, Environmental Affairs and Rural Development, KwaZulu-Natal Provincial Government, Pietermaritzburg

DEAT. (2004). Environmental Management Plans, Integrated Environmental Management, Information Series 12, Department of Environmental Affairs and Tourism, Accessed at http://www.nda.agric.za/doaDev/topMenu/DoAProgrammes/NRM.htm

DEAT. (2006). South Africa Environment Outlook: A Report on the state of Environment, Department of Environmental Affairs and Tourism, Pretoria

DEAT. (2007). The National Protected Areas Expansion Strategy 2008-2012: A Framework for Implementation, Department of Environmental Affairs and Tourism, Pretoria

DRDLR. (2009). The Comprehensive Rural Development Programme Framework, Department of Rural Development and Land Reform

Driver. A., Maze. K., Rouget. M., Lombard. A. T., Nel. J., Turpie. J. K., Cowling. R. M., Desmet. P., Goodmand. P., Harris. J., Jonas. Z., Reyers. B., Sink. K., and Strauss. T. (2005). National Spatial Biodiversity Assessment 2004: Priorities for biodiversity conservation in South Africa, Strelitzia 17, South African National Biodiversity Institute, Pretoria.

DSPED. (2010). UThukela District Municipality Integrated Development Plan (IDP), Department of Strategic Planning and Economic Development, Draft 2010/2011, Ladysmith

DWAF. (2001). Guidelines on the establishment and management of Catchment Forums, Department of Water Affairs and Forestry, KZN Regional Office: Durban, Integrated Water Resource Management Series: Sub-Series No. MS 6.1., South Africa

DWAF. (2004). Internal Strategic Perspective: Thukela Water Management Area, Department of Water Affairs and Forestry, Prepared by Tlou and Matji (Pty) Ltd, WRP (Pty) Ltd, and DMM cc on behalf of the Directorate: National Resources Planning (East)

Emongor. R. A., Esilabab. A. O., Munyasi. W. J., Nyamwaro. S. O., Maina. I. N., Miruka. K. M., Wekesa. L., and Kibet. P. K. (No Date). Appraisal of Information Communication Needs for Mainstreaming Integrated Natural Resource Management into Organizations in the Makueni County, Kenya, Kenya Agricultural Research Institute, Proceedings of the 12th Kari Biennial Scientific Conference

GIZ. 2012. Integrating Ecosystem Services into Development Planning: A stepwise approach for practitioners based on the TEEB approach.

Global Footprints. (2013). What is Sustainability?, HEC Global Learning, Accessed at: http://www.globalfootprints.org/page/id/0/5/

Global Water Partnership. (2012). What is IWRM?, Accessed at: http://www.gwp.org/The-Challenge/What-is-IWRM/

Harwood. R. R., and Kassam. A. H. (2003). Research Towards Integrated Natural Resource Management: Examples of Research Problems, Approaches and Partnerships in Action in the CGIAR, Consultative Group on Integrative Agricultural Research, Rome

Kanz, W.A, O'Connor T.G, Richardson J. Nel, J. Nel, W. 2009. The Uthukela District Municipality Biodiversity Sector Plan. Unpublished Report, Ezemvelo KZN Wildlife, Pietermaritzburg.

Lewis. F., and Zunckel. K. (2013). Selecting and Designing Economic Instruments to Create Incentives for Improved Natural Resource Management: A Case Study in the Upper uThukela District, South Africa, Afromaison, Institute of Natural Resources NPC.

Lockwood. M., Davidson. J., Curtis. A., Startford. E., and Griffith, R. (No Date). Governance Principles of Natural Resource Management, Society and Natural Resources

Matthew. L., and Catacutan. D. C. (May 2012). Integrated Natural Resources Management in the Drakensberg (uThukela), Afromaison: Workplan and Stakeholder Consultation Process, Chapter 3

Margules, C.R and Pressey, R.L. 2000. Systematic Conservation Planning. Nature, Vol 405, May 2000.

Masakong Management. 2008. Review of the effectiveness and efficiency of the Environmental Impact Assessment (EIA) System in South Africa. Draft report for Review. Submitted to the Department of Environmental Affairs, Pretoria.

Mauck. G. E. (2012). Inclusion of the Implementation of Integrated Water Resources Management Under South African Water Law and Policy, Master or Law Thesis, University of KwaZulu-Natal, Pietermaritzburg

McCosh. J, Dickens. J., and Johnston. R. (2013). Sustainable Land Management Interventions for the Uthukela District Municipality, Afromaison, Institute of Natural Resources, Pietermaritzburg, South Africa.

Ochola. W. O., Sangina. P. C., and Bekalo, I. (2010). Managing Natural Resources for Devolvement in Africa: A Resource Book, University of Nairobi Press (UONP), Kenya

PEGAGYS. (April 2013). Natural Resources Governance Systems, Pegasys: Strategy and Development, Water Research Commission

Pollard. S., and du Toit. D. (2008). Integrated Water Resource Management in Complex Systems: How the Catchment Management Strategies Seek to Achieve Sustainability and Equity, Association for Water and Rural Development (Award), Vol. 34: No. 6

Pommerieux. M. (2012). Monitoring and Evaluation of a Participative Planning Process for the Integrated Management of Natural Resources in the Drakensberg Area – South Africa, A Report Submitted After a Six-Month Internship in Fulfilments for MSc. in Environmental Sciences And Policies, Universite Pierre Et Marie Curie.

Quayle, L. and C. Pringle. 2013. Assessment of ecosystem services in the Uthukela District Municipality. Report to Afromaison, a project funded under the Seventh Research Framework of the European Union. Institute of Natural Resources, Pietermaritzburg, South Africa.

Rittle. H. W. J., and Webber. M. M. (1973). Dilemmas on a General Theory of Planning, Policy Sciences, Vol. 4, Pp. 155-179

SADC. (2008). Southern Africa Environment Outlook, SADC, SARDC, IUCN and UNEP, Gaborone/Harare/Nairobi

SANBI. (January 2014). SIP 19: Ecological Infrastructure for Water Security, South African National Biodiversity Institute, Revision 4.1: Draft for Discussion Purposes Only

Society of Ecological Restoration. (2013). Ecosystem Approach, Global Restoration Network: A Project of the Society for Ecological Restoration Network, Accessed at: http://www.globalrestorationnetwork.org/restoration/ecosystem-approach/

SouthAfrica.info. (2011). Accessed at: www.southafrica.info/about/government/gov.htm

Stronkhorst. L., Mapumulo. C., Trytsman. G., Breytenbach. F., Lötter. L. and Mpanza. T. (2010). Local Level Land Degradation Assessment on Commercial Farms in Winterton, KwaZulu-Natal Province, Agricultural Research Council – Institute for Soil, Climate and Water, ARC-ISCW Report Nr. GW/A/2010/36, Project Nr. GW/56/017

TEEB. (2010). A Quick Guide to the Economics of Ecosystems and Biodiversity for Local and Regional Policy Makers

United Nations, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, and World Bank. (2005). Handbook of National Accounting, Integrated Environmental and Economic Accounting 2003: Studies in Methods, Series F, No.61, Rev.1, Glossary, United Nations, New York, para. 7.42, EA.1

UThukela District Municipality. (2011). uThukela Spatial Development Framework Draft

Van der Linde. M. (2006). Compendium of South African Environmental Legislation, Centre for Human Rights, Faculty of Law, University of Pretoria.

Waldron. S. (2013). Afromaison Workpackage 7: Role Playing Game Final Summary Report, Afromaison, Institute of Natural Resources.

Working on Fire. (2011). Accessed at: http://www.workingonfire.org/history.php

WRP. (No Date).Wetland Rehabilitation, Wetlands Research Programme, WRC Project No. K5/1408

9781431206964