

AMAJUBA DISTRICT MUNICIPALITY ENVIRONMENTAL MANAGEMENT PLAN

Final Report

PREPARED BY



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PREFACE

Recently it has been widely recognised that a Land Use Management System (LUMS) should include environmental controls.

Although referred to as an Environmental Management Plan (EMP) this study limits its focus to the management of the natural and built environment. Whilst Council recognizes the importance of the social and economic environments, these aspects are to a large extent covered in Council's IDP. Moreover, the very direct correlation between the quality of the natural environment and the sustained development of potentially sustainable development options means that this first iteration of the EMP should concentrate on the natural environment. The EMP can be expanded and refined in future review cycles. At this stage it is recommended that:

- Council adopts this EMP as part of the Integrated Development Plan (IDP).
- Amendments to the LUMS and or any existing Town Planning scheme are initiated to give effect to the recommendations contained in this report.

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Chapter 1 Introduction

1.1 INTRODUCTION

Integrated Development Plans for all Municipalities have been prepared in terms of the requirements of the Municipal Systems Act 2000. One of the components of the IDP is an Environmental Management Plan (EMP). Amajuba District Council initiated this to comply with this requirement.

The Environmental Plan should, where appropriate, contain:

- i) a statement on the environment
- ii) an identification of key areas of intervention
- iii) policies and strategies linked to a spatial plan

The District is characterized by a range of environments including commercial agricultural areas, forestry and areas with inherent economic opportunity such as the tourism area. A small proportion of the district is characterized by urban (built up) settlement. This is concentrated along the Newcastle-Madadeni-Osizweni axis and around the core areas of Utrecht, Charlestown, Dannhauser, Hattingspruit and in the Blaauwbosch/Buffalo Flats area.

In summary the land use reflects the spatial distribution of economic activity. Mining and quarrying are distributed along the east-west coal seam and the north-south seam. The predominant land use is agricultural. Commercially cultivated areas are clustered in the southern portion of the district as well as to the east. Irrigated farming activities are concentrated along the Buffalo River in the central portion of Amajuba. The major crops are maize and wheat. Subsistence agriculture is the predominant land use in Buffalo Flats- Blaauwbosch area. The greatest proportion of the District is grassland, which is utilized for grazing. Forestry is prevalent in the higher lying areas, mainly in the northeastern part of Utrecht, along the N11 (Laingsnek Pass), and in the southwestern areas of the district. (SiVEST/ Deloitte & Touche)

Many of the grasslands present in the area have been degraded by prolonged selective and over-grazing in the past. Bush encroachment of *Acacia* sp. has been the result. Soil erosion and trampling in wetlands is also a large problem in the district and is as a result of poor livestock management (Metroplan, 2000).

- a) The following key issues were identified under the Environmental sector:
 - < To identify and map areas of environmental priority for the TLC area as a whole.
 - < To work towards an Integrated Open Space System.
 - < To introduce and implement environmental controls.
 - < To foster environmental awareness through interested groups and direct communication with residents and ratepayers.

- b) The guiding policies for this Environmental Spatial Framework include the following:
 - < retain and enhance the environmental quality of the area
 - < promote development opportunities with due regard to possible impact on environmentally sensitive areas

One of the goals of this Environmental Spatial Framework is to “identify areas of environmental sensitivity and take steps to ensure long term conservation and management of these areas”.

- c) These principles are carried through into the development strategies, where specific actions are recommended for each key issue. Under the Environment, the following, *inter alia* is recommended:
- < To undertake a strategic environmental assessment to identify opportunities and constraints on development in the district and propose projects that the DC can under take.
 - < Draw up an Environmental Management Plan (EMP).

1.2 ENVIRONMENTAL MANAGEMENT SYSTEMS

Environmental Management should be an integral part of a District Councils overall land use management system. The design of an Environmental Management System (EMS) is an ongoing and interactive process. The structure, responsibilities, practices, procedures, processes and resources for implementing environmental policies, objectives and targets can be coordinated with existing efforts in other areas (eg. Operations, finance, occupational health and safety).

Key principles for managers implanting or enhancing an EMS include, but are not limited to the following:

- Recognise that environmental management is amongst the highest public priorities.
- Establish and maintain communication with internal and external interested parties.
- Determine legislative requirements and environmental aspects associated with the organisations activities, products or services, and those bodies, which fall under their management.
- Develop management, employee and resident commitment to the protection of the environment, with clear assignment of *accountability and responsibility*.
- Encourage environmental planning.
- Establish a process for achieving targeted performance levels.
- Provide appropriate and sufficient resources, including training, to achieve targeted performance levels on an ongoing basis.
- Evaluate environmental performance against the organisation’s environmental policy, objectives and targets, and seek improvement where appropriate.
- Establish a management process to audit and review the EMS and to identify opportunities for improvement of the system and resulting environmental performance.
- Encourage or bind contractors and suppliers working in the area to comply to the local EMS, or establish their own EMS which should be reviewed by the local council.

A District Council should implement an effective EMS in order to help protect human health, and the environment from the potential impacts of unfettered development, and mismanagement resulting in environmental abuse and degradation, and to assist in maintaining and improving the quality of the environment.

Having an EMS can help an organisation provide confidence to interested parties that:

- a management commitment exists to meet the provisions of it policy objectives and targets;

- emphasis is placed on prevention rather than corrective action;
- evidence of reasonable care and regulatory compliance can be provided; and
- the systems design incorporates the process of continual improvement.

The District Council implementing an EMS gives itself the opportunity to link environmental objectives and targets with specific financial outcomes and thus ensures that the resources are made available where they will provide most benefit in both financial and environmental terms. The potential benefits associated with an effective EMS include:

- assuring the public of commitment to demonstrable environmental management;
- maintaining good public / community relations;
- improving access to capital;
- insurance risks decrease when vegetation adjacent to properties is well managed, for example, not being a fire hazard;
- improving cost control;
- reducing incidents that result in liability;
- demonstrating reasonable care;
- conserving resources and energy;
- *facilitating the attainments of permits and authorisations;*
- fostering development and sharing environmental solutions;
- improving government/government and public/government relations.

1.3 EMS PRINCIPLES AND ELEMENTS

Commitment and policy:

The district authority should define its environmental policy and ensure commitment to its EMS.

Planning:

The District Council should formulate a plan (this document) to fulfil its environmental policy.

Implementation:

For effective implementation, the district authority should develop the capabilities and support mechanisms necessary to achieve its environmental policy, objectives and targets.

Measurement and evaluation:

The District Council should measure, monitor and evaluate its environmental performance.

Review and improvement:

The District Council should review and continually improve its EMS, with the objective of improving its overall environmental performance.

1.4 ENVIRONMENTAL MANAGEMENT PLAN(S)

Within the general planning of activities, a district council should establish an Environmental Management Plan (EMP) that addresses all of its environmental objectives. To be most effective this EMP should be integrated into the organisations strategic plan and IDP. This EMP will address schedules, resources and responsibilities for achieving the council's environmental objectives and targets.

Within the framework provided by environmental management planning, this EMP will identify specific actions in order of PRIORITY to the council. These actions may deal with individual processes, projects, services, sites, or facilities within a site.

This EMP should help the District Council to improve its environmental performance. It is however a dynamic plan, and should be revised regularly to reflect changes in organisational objectives and targets.

This Environmental Management Plan will therefore form part of the IDP and its main objectives are:

- i) To provide Council with an environmental inventory which provides the basis for establishing an interlinking system of conservation reserves, good agricultural land and public spaces, and which will assist council in the process of development management
- ii) to minimise harmful developmental tendencies which may affect the environment
- iii) to recommend environmental principles which will assist in the maintenance and improvement of the present urban environment
- iv) to designate boundary limitations of conservation areas in the area to enhance species survival in the long term.

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Chapter 2 Methodology

2.1 METHODOLOGY

- 2.1.1 The Land Potential was mapped using information from Cedara as part of Report N/A/98/2(Guy R.M. & Smith J.M.B). This map was contextualised within the region by inserting district, municipal and farm boundaries. Wetland data and irreplaceability index data were accessed from KZN wildlife identifies critical areas in the district. These were then mapped to create a spacial perception of the area and the management strategies. Further this map was overlaid over the land potential to identify potential conflict areas, such as where high land potential and completely irreplaceable areas exist. The potential for four forestry species is mapped to include there predicted yields.
- 2.1.2 Management options are suggested for sustainable resource use under different land use options such as forestry.
- 2.1.3 The mapping is broad and any development included in the Environmental Conservation Act as listed would require further investigation as part of the Environmental Impact Assessment process.

2.2.1 LINKAGE

The linking of natural systems is an important consideration and objective in designing an environmental management plan.

Open spaces or conservation reserves in an urban environment may be regarded as 'islands'. The number of species found on an 'island' is dependent on the size of the 'island' and the connectivity between them. Larger reserves and those situated close to each other, sustain more species. Conservation reserves might be established on lots within the Amajuba district which would be suitable for this purpose. A conservation reserve is described as land reserved for conservation purposes, in terms of both fauna and flora, in which invasive alien plants are pro-actively removed and subsequently managed, indigenous plant growth is encouraged and protected, supports the establishment and development of endemic/indigenous fauna, and is maintained by the local council.

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Chapter 3 Management Recommendations for the Natural Management Systems

3. KEY MANAGEMENT AREAS

The district lies in Veld type 66 (Natal Sour Sandfield) according to Acocks, 1968 and the Interface between Bioresource Groups 12 (Moist Tall Grassland) and BRG 13 (Dry Tall Grassland). The veld type 66 exists on shallow sandy soil and is generally an open savanna. (Acocks, 1974) The Dry Tall Grassland is dominated by *Hyparrhenia hirta* with occasional *Acacia sieberana* savannas or woodlands. *Acacia sieberana* is more dominant where streams debouch from kloofs onto plains (Achocks, 1974) Disturbed areas have tall communities of *Hyparrhenia dregeana*, *Hyparrhenia tamba*, etc. The grasslands have been identified as of 'intermediate' value in a provincial SEA conducted by KZN Wildlife. The Grassland Biosphere Initiative is an important initiative within the district to protect this important resource. (*SIVEST /Deloitte and Touche*).

3.1 WETLANDS

3.1.1 Discussion

A wetland has been defined as "land where an excess of water is the dominant factor determining the nature of soil development and the types of plant and animal communities living at the soil surface" (Begg, 1984). Wetlands occupy a characteristic position in the landscape with impeded drainage. Inland wetlands include fresh water areas and can be likened to a basin which is filled with soil that has an impervious layer that retains water.. The lowest point is normally obstructed by a rock dyke or sill or even an alluvial ridge that acts as a dam wall. This key point is ultimately responsible for the wetland holding water and whilst resisting erosion, forces the collected water to the surface to support plant growth and sustain stream flow (Wyatt 1995). Wetlands are characterised by distinctive soil types formed under wet conditions.

It is normally possible to determine if wetlands exist by being able to identify a few plant types such as bulrushes, reeds, sedges, mangroves and other water loving trees and grasses. Some wetlands are obvious, but others are not easily recognised, often because they are dry during part of the year or because they just don't look very wet at first sight. Hydrophytic species used to indicate wetlands for the purpose of this study are: *Zantedeschia aethiopica*, *Phragmites* sp., and species of the *Cyperaceae* family.

Wetlands are considered to be one of the most seriously endangered ecosystems in the world (Begg, 1984) and this is no more evident than in KZN. Wetlands offer a multitude of advantages to the environment in which they are located (as well as those downstream): The plant cover fills an important function of intercepting surface runoff and reducing water velocity through the increased resistance caused by the plants. This also allows time for water scrubbing, filtering and infiltration into the soil. Of all the wetlands processes operative in the environment, infiltration is probably the most important. This is the process by which water soaks up into the soil and replenishes the moisture stored therein. In most wetlands the passage of water through the soil profile is slow, often due to the high clay content, together with the gentle gradient of the wetland.

Water which flows this particular route remains within the catchment for the longest possible time and in so doing sustains the flow of streams (Wyatt 1995).

Values are derived directly from the existing wetland functions, for example, to establish the value of a function such as flood attenuation, one should ask what the cost would be to replace that function. Other values are: soil erosion protection (the implied monetary value would be that soil will be retained on the land/farm and clean water will be available for tourism); flood control and stream flow regulation (protection of human life and property); water cleansing (longer life of dams and cleaner, safer, cheaper water); provision of stock grazing (milk and meat); provision of wildlife habitat including aquatic nurseries (fishing, hunting, material harvesting, education and game viewing) (Wyatt 1995).

Urbanisation results in high peak flow rates and volume discharges of water, requiring progressively larger and more expensive installations downstream. Groundwater recharge is also reduced and this lowering of the water table detrimentally affects the existing vegetation. Maintenance of wetlands and the natural drainage pattern can reduce these adverse effects (Bishop and Oberholzer, 1983).

3.1.2 Recommendations

3.1.2.1 Where not zoned for development, wetlands should be given conservation status.

3.1.2.2 Wherever possible, wetlands shall not be drained, filled or in any other way artificially altered.

3.1.2.3 Where construction or dredging of canals is necessary, these must be designed to minimise degradation of wetland functions.

3.1.2.4 For example, roads shall be elevated above the wetland surface. If this is not possible, then the culvert pipes must be sufficiently large and spread throughout the length of the wetland to cause the least disruption of the natural system.

3.1.2.5 Access to wetlands by off-road vehicles, man and livestock, must be prevented.

3.1.2.6 Wherever possible, degraded wetlands shall be rehabilitated. For example, if degraded by pollution, the cause of pollution must be removed.

3.1.2.7 Wetland vegetation must be maintained and all exotic vegetation shall be removed. The wetland character will thus be maintained. This will facilitate drainage, improve water quality, and help to prevent further exotic plant encroachment.

3.1.2.8 If the wetland occupies only a portion of the site, where necessary, these areas shall be fenced off. The fencing used should be appropriate and shall allow for the movement of small animals, which may be found in this area.

3.1.3 Draft Norms and Standards as compiled by the Department of Agriculture and Environmental Affairs (DAEA)

3.1.3.1 Infilling, drainage and hardened surfaces (including buildings and asphalt) should not be located in any of the wetland zones (i.e. permanent, seasonal and temporary).

Motivation: such activities generally result in significant impacts on a wetland's hydrology, hydraulics and biota and on the goods and services wetlands provide.

3.1.3.2 Hardened surfaces and erven should be located at least 15 m outside of the outer boundary of the seasonal/permanent zone (Note: if the width of the outer temporary zone is greater than 15 m and Item 1 above is met then this requirement would automatically be met).

Motivation: The seasonal and permanent zones generally have surface water for extended periods. In the case of seasonal, it may be for most of the wet season and in the case of permanent, it may be throughout the year. A buffer is required between areas potentially generating non-point source pollution and such areas characterized by surface water.

3.1.3.3 Extension to the buffer in localized areas should also be included to minimize the impact of concentrated stormwater run-off into the wetland. Stormwater outflows should not enter directly into the wetland. A predominantly vegetated buffer area at least 20 m wide should be included between the stormwater outflow and the outer boundary of the wetland, with mechanisms for dissipating water energy and spreading and slowing water flow and preventing erosion. This buffer is particularly important when the catchment feeding the stormwater drain comprises predominantly hardened surfaces.

Motivation: Extensive hardened surfaces in the catchment and stormwater drains significantly increase the intensity of stormwater runoff, which increases the risks of erosion in a wetland. In addition, urban stormwater runoff is often polluted. A buffer is therefore required to reduce the energy and erosive power of the stormwater and to decrease the level of pollutants in the runoff before it enters the wetland.

3.1.3.4 Where the wetland has a particularly high biodiversity value, further buffering may be required, the width of which would depend on the specific requirements of the biota.

Motivation: The value of a wetland for biodiversity derives not only from features of the wetland but also from the quality of natural, non-wetland areas adjacent to the wetland, as many wetland dependent species such as the giant bullfrog (Pyxicephalus adspersus) require both wetland and non-wetland habitat.

3.1.3.5 If a road crossing is planned in a wetland, first seek an alternative route. If this is not available then ensure that the road has minimal affect on the flow of water through the wetland (e.g. by using box culverts rather than pipes). Do not lower the base level of the wetland or any stream passing through the wetland. Ensure an adequate buffer is present to deal with run-off from the road (see Item 3 above). During construction, minimize disturbance of the wetland at and adjacent to the road crossing site.

Motivation: road crossings may potentially greatly modify local water flow patterns in a wetland. In addition to having a damming or draining effect on the flow upstream of the road, roads which do not allow for the adequate passage of water may concentrate flow downstream, increasing the erosion hazard and drying out this portion of the wetland. A lowering of the base level increases the gradient in the wetland, thereby increasing the speed of water flow and its erosive potential and the extent to which it contributes to lowering the water table.

3.1.3.6 Where a road runs alongside a wetland and it intercepts natural hillslope runoff into the wetland, the road should be set back from the boundary of the wetland by at least 20 m and feed-off points should be included at frequent intervals along the road (at least every 100 m) and the outflows of these should conform to the requirements of the stormwater outflows (given in Item 2 above).

Motivation: a road running alongside a wetland can strongly affect the natural hillslope runoff into the wetland by intercepting this runoff and concentrating it in localized entry points. The fewer the feed-off points into the wetland and the less protected they are, the more severe this effect will be.

3.1.3.7 Where development (e.g. hardened surfaces, infilling and drainage) in a wetland is unavoidable then the resulting impacts must be mitigated. In many cases, off-site mitigation may be the only means of achieving satisfactory mitigation.

Motivation: The cumulative loss of wetlands in South Africa is already very high (see Section 1.1) and the continued net loss of wetlands needs to be prevented. Invasion of a wetland by alien plants may considerably reduce the integrity of a wetland.

3.1.3.8 Where any disturbance of the soil takes place in a wetland, clear alien plants which establish and follow up for at least 2 years thereafter.

Motivation: disturbance of a wetland favours the establishment of alien plants, which require long-term control.

3.1.3.9 Where the infiltration rate of a wetland's catchment is naturally high and the wetland is maintained predominantly by groundwater input, at least 60% of the wetland's catchment should remain as permeable surfaces in a residential area and preferably at least 30% in an industrial/commercial area. Where the level of development is very high, reduced surface runoff can be promoted through mechanisms such as porous pavements (The inclusion of these mechanisms in areas dominated by hardened surfaces is generally sound catchment management practice and should be encouraged widely).

Motivation: Failure to maintain groundwater input to a predominantly groundwater-fed wetland will considerably alter the hydrological regime of the wetland, thereby compromising its integrity.

3.1.3.10 Municipalities should conduct inventories (according to the guidelines developed by National Department of Environmental Affairs and Tourism) of

the wetlands contained in their areas. These should include delineation and mapping (at a minimum scale of 1: 50 000) of the wetlands.

Motivation: such an inventory, and the wetland map in particular, provides a very powerful tool for planning and strategic environmental assessments.

This has, on the most part, been covered by the Environmental Management Plan. All the wetland resources in the Amajuba District have been mapped using KZN wildlife information.

3.1.3.11 The onus is on the developer to identify and delineate all wetlands in the project area at a finer scale depending on the proposed development. Mapping at a minimum scale of 1: 10 000 is generally required.

Motivation: in order to account for the impact of a development adjacent to a wetland, it is essential that the boundary of the wetland be mapped.

3.1.3.12 Any development must comply with the requirements of the National Water Act. Through the concept of the “ecological reserve”, this act makes provision for ensuring water of acceptable quantity and quality for maintaining the ecological functioning of wetlands and river systems.

Motivation: While wetlands assist in enhancing water quality, they should not be relied upon as an easy substitute for addressing pollution at source, as this may lead to serious impacts to the wetland systems.

Many of these issues would be covered by the EIA process however it is the responsibility of the District and Local Municipalities to ensure that illegal development does not occur and insure that infrastructure development on the part of the Municipalities strictly adhere to these recommendations.

3.2 STREAMS AND RIVERS

3.2.1 Discussion

The district has an extensive system of rivers and tributaries, with those in the Utrecht district forming the headwaters of the Pongola river. This extensive system has been categorized in the provincial SEA as of high and intermediate value (SiVEST/ Delloite & Touche).

3.2.2 Recommendations

Eight key principles for *effective water resources management* had been identified by the The International Water and Sanitation Centre (IRC) and United Nations Development Programme (UNDP) and agreed upon internationally. These were:

- 3.2.2.1 Water source and catchment protection are essential;
- 3.2.2.2 Water must be adequately allocated;
- 3.2.2.3 Water must be used efficiently;
- 3.2.2.4 Management must be delegated to the lowest appropriate level;
- 3.2.2.5 All stakeholders need to be involved in decision making;
- 3.2.2.6 There should be gender equity in water resources management;
- 3.2.2.7 Skills and capacity should be built; and

3.2.2.8 Water should be treated as an economic and a social good.

In terms of actual river and stream management recommendations the following are suggested: It is however critical that in protecting water resources we protect the streams rivers and catchment areas and visa versa

3.2.2.9 Flow or level of water shall not be artificially altered.

3.2.2.10 Strict policing of illegal dumping must be undertaken. This should be a highly visible process in which offenders are seen to be punished. A system of facilitating the policing and reporting of illegal dumping by members of the public should be introduced.

3.2.2.11 All vegetation on the banks of streams and rivers must be protected.

3.2.2.12 All vegetation within 10m of the banks of the rivers or to the 1:100 year floodline, (the greater distance), and within 3 m of the banks of all streams shall be given conservation status. This vegetation is very important for preventing erosion of the water channels and reducing the periodicity of flow.

3.2.2.13 Pollution by toxic substances, excessive nutrients (phosphates and nitrates) and suspended particulate matter is to be avoided.

3.2.2.14 Contamination by aquatic weeds is to be strictly forbidden as excessive growth of these plants will reduce the amenity, conservation and recreation values of these systems, and will be expensive to eradicate.

3.2.2.15 The Catchment Management Agency's (CMA) focus will be the control of both inputs in terms of pollution and water use from rivers mainly affecting smaller users such as forestry and agriculture that utilise raw water. They are in the process of being established throughout the province and will act as the governing body for raw water resources. They will thus assume much of the responsibility of ensuring that the water resources are managed The Municipality should however ensure their support of the Catchment Management Agency and help enforce compliance with all water users including themselves. Further conservation of river vegetation is not clearly the responsibility of the CMA and as such the municipality needs to take on some of that responsibility.

3.3 INDIGENOUS FOREST

3.3.1 Discussion

Forests are defined as a closed-canopy assemblage of woody tree species greater than 5 m in height (Midgley, et al., 1997). This definition purposefully avoids other definitions, developed in the tropics that use multiple strata and are as a result restrictive.

Indigenous forest represents the smallest biome in southern Africa (Rutherford & Westfall, 1994). Regardless of this fact, forests still support a high proportion of the regions floral and faunal diversity (Geldenhys, 1989). The greatest diversity of forest types is found in KwaZulu Natal. This is as a result of the dramatic altitudinal gradient that exists between the coast and the escarpment. The value of forests in KwaZulu Natal has largely been unappreciated due to their small economic value (Midgley et al, 1997). More importantly forests have an important contribution to water and soil conservation

this too has been largely overlooked (Lawes, et al., 1999) When looking at economic value however it is important to consider the replacement value of the forest for services they provide that if removed would have to be replaced with alternatives.

The integrity of indigenous forests and the conservation of the species within them are vulnerable for the following reasons:

- Climatic conditions favour agriculture in KwaZulu Natal; this has led to major land transformation over the years.
- The encroachment of plantation species has also had a detrimental effect due to the increases in the incidence and severity of fire damage.
- The illegal removal of natural resources also has the potential to cause local extinction of species within the forests.

Forests in the area are small and unlikely to be able to maintain a high level of resource removal, be it controlled or uncontrolled, sustainably.

Forest resources in the district are considered in poor condition and lack an active management plan or strategy. More recently traditional ownership and land claims have become important issues that require careful negotiation, and accurate information to prevent resource degradation as a result of misunderstandings between groups.

All indigenous forests in KwaZulu-Natal are considered important and any activity threatening to disturb the integrity of any forest resource should be thoroughly investigated. Until a clear policy dealing with the responsibilities, conservation and management of indigenous forest is implemented KZN wildlife considers all forested areas outside of KwaZulu-Natal nature conservation services as threatened (Goodman, 2000).

3.3.2 Recommendations

3.3.2.1 This vegetation must be retained and given conservation status.

3.3.2.2 No undergrowth may be removed or the natural forest structure interfered with in any way. When the forest undergrowth is removed, the large trees left standing often slowly die due to drought (Wager, 1976).

3.3.2.3 All forest along streams and rivers must be conserved to prevent bank erosion.

3.3.2.4 Wherever possible, patches of forest must be linked to form a continuous network and thus a path of migration for flora and fauna present (bushbuck, duiker, birds and so on).

3.3.2.5 Forest trees shall be left to screen development

3.4 GRASSLANDS

3.4.1 Discussion

This refers mainly to the Acocks 66 (Natal Sour Sandveld), this vegetation type has 58% of its area untransformed. It only exists in KwaZulu-Natal and is thus endemic to the province. This means that its conservation status is high. However the percentage of remaining untransformed area required to protect a 10% sample area is only 17% and there are therefore many conservation options for this veld type and as such conservation areas targeted at specific species will also be able to cover the

conservation of the veld type as a whole. This veld type however has only 2% of its distribution under formal conservation. As a result of its poor representation in protected areas and the threat of land transformation by agriculture KZN wildlife recommends that all grasslands and specifically the Natal Sour Sandveld be treated as severely threatened (Goodman, 2000).

3.4.2 Recommendations

3.4.2.1 These areas should be given conservation status.

3.4.2.2 Landowners must be encouraged to leave pockets of this group undisturbed. For example areas surrounding known Wattle Crane nesting sites should be left undisturbed. This would make any farm more attractive.

3.4.2.3 Paths shall be kept to a minimum, and trampling reduced.

3.4.2.4 Planned, controlled burning should take place to remove moribund material. However, excessive burning must be prevented. The KZN Nature Conservation Service (now KZN Wildlife) could be consulted with respect to the frequency with which burning should take place.

3.5 WHITE WINGED FLUFFTAIL NESTING SITES

3.5.1 Discussion

It is known in only three localities one of which is the Wakkerstroom wetland.

3.5.2 Recommendations

KZN wildlife suggests that no modification of its known habitat should be considered (Goodman, 2002).

3.6 RUDD'S LARK NESTING SITES

3.6.1 Discussion

Little is known of this species other than the fact that it is confined to short grassland areas. It is only known in eight points inside two widely separated areas.

3.6.2 Recommendations

Buffer areas are suggested that are inviolate in known localities.

3.7 WATTLED CRANE NESTING SITES

3.7.1 Discussion

The breeding habitat of the Wattle Crane is permanent in the mashes and grasslands of the district. Direct threats to the Crane breeding sites are:

- Drainage for ridge and furrow agriculture
- Damming to provide irrigation
- Recreational waters
- Forestry

3.7.2 Recommendations

A 5 km radius around sightings and 10 km radius around nesting sites is recommended (Goodman, 2002)

3.8 ORIBI HABITAT

3.8.1 Discussion

Oribi antelope exist in the southwestern regions of the district. Their habitat is threatened by land transformation as a result of the fact that the land is of good agricultural potential.

3.8.2 Recommendations

Parts of the habitat are protected in the Chelmsford Nature reserve however there is a need to extend the protection of this habitat.

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Chapter 4 Management Recommendations for Forestry Developments

4. Forestry Guidelines (Department of Water Affairs and Forestry, 2002)

The areas for potential forestry development have been mapped for four species however for this development to be sustainable it is critical that management practices be strictly monitored. The management of any forestry developments including existing and new developments should be closely monitored. DWAF provides a comprehensive set of criteria and indicators by which the municipality can assess the sustainability of forestry developments. Much of the criteria could however be adapted to assess the sustainability of indigenous forest management systems also.

Criteria and indicators for plantations

This set of criteria and indicators refer only to commercial forestry and criteria and indicators not relevant to either commercial plantations or Amajuba have been removed but are available on the site listed in the reference list. The original numbering has however been maintained for easy reference to the original set. This set is extremely comprehensive and while it may not be possible to monitor all these factors at present it should be a guide for future monitoring and development. There is however criteria and indicators that is essential and as such should be concentrated on by the municipality. Attention will be drawn to these in the text.

Criterion 1 Natural forests are protected.

Indicator 1.2: State of forest protection.

Measure 1.2.1: Number and type of reported transgressions (by category) in terms of the National Forestry Act.

Measure 1.2.2: Number of permits allocated for licensed activities in terms of section 23 of the NFA.

These are relatively easy to monitor if the capacity for enforcement exists within the NFA. It may be helpful however to educate and consult communities close to forestry development as they can act as the watchdog to ensure those transgressions are reported. This a particularly important indicator as it relates not only to the sustainable management of forestry but also to the conservation of indigenous forest.

Criterion 3 Forest ecosystem structures are conserved and processes maintained.

Indicator 3.4: Extent and connectivity of natural ecosystems.

Measure 3.4.2: Mean area and number of natural habitats by habitat type between plantations.

Measure 3.4.3: Proportion (area) of untransformed to transformed land.

Indicator 3.5: Rehabilitation of degraded forests.

Measure 3.5.1: Number and area (ha) of sites identified as requiring rehabilitation that are being addressed.

Indicator 3.6: Nutrient cycling.

Measure 3.6.2: Organic carbon levels (Total organic carbon content) in the topsoil (not the humus layer) measured in sample sites as a trend, once every 10 years.

This would be more costly to measure however the forestry companies do much of their own investigations and many are ISO1400 certified and as such may have this information. This information should be accessed and monitored where possible by the municipality. Where the information is not accessible the organisation should be encouraged to become environmentally certified as this will both increase marketability of the product in international markets and enable the municipality to ensure that forestry activities within the district remain sustainable. Again this relates to both the sustainability of the forestry development and the conservation of indigenous forests.

Criterion 4 Forests are protected from negative effects of fire, pests and diseases, and alien invader plants.

Indicator 4.1: Impacts of pests and diseases.

Measure 4.1.1: Area of plantation negatively affected by insect pests and diseases.

Indicator 4.2: Negative impacts of fire.

Measure 4.2.1: Number and area of sites negatively affected by fire.

Measure 4.2.2: Change in fire protection expenditure.

Indicator 4.3: Infestation by alien invader plants.

Measure 4.3.1: Infestation area and stand densities per species of alien plant invader species.

These are essential criteria that the municipality should be monitoring. This could potentially be included with an agricultural extension service. This information should also be available from the organisations and should be collected and monitored by the Municipality.

Criterion 5 Production potential is maintained or improved.

Indicator 5.1: Standing stock assessment.

Measure 5.1.1: An inventory of the available resources (plants/ha, volume/ha, tons/ha, or related measure), recorded once in harvest cycle.

Measure 5.1.2: Area of plantations, recorded annually.

Indicator 5.2: Level/rate of resource use.

Measure 5.2.1: Ratio of annual removals to annual growth (increment).

Indicator 5.3: Level of multiple resource use from forest ecosystems.

Measure 5.3.1: The range of direct benefits to stakeholders arising from the use of resources in the Forest management Unit (FMU)

Indicator 5.4: Identification and development of new alternative forest resources.

Measure 5.4.1: Number of initiatives to develop new alternatives.

Measure 5.4.2: Number and area of initiatives implemented to produce alternative resources.

Indicator 5.5: Resource use efficiency.

Measure 5.5.1: Ratio of waste to volume harvested.

This information should be available from the organisation and should be monitored a drop off in productivity is a very good indicator of an unsustainable practice and will often indicate business problems.

Criterion 6 Soil and water resources are conserved.

Indicator 6.1: Water quantity.

Measure 6.1.1: Stream flow water volume and variation in forested catchments.

Indicator 6.2: Water quality.

Measure 6.2.1: Diversity of aquatic organisms measured annually and in association with relevant forestry activities using SASS 5 techniques.

Measure 6.2.2: Turbidity levels (ppm) measured in association with relevant forest management or utilisation activities.

Indicator 6.3: Soil conservation.

Measure 6.3.1: Area (ha) affected by erosion.

Measure 6.3.2: Percentage of the incidence of erosion addressed by corrective action.

Indicator 6.4: Riparian zone and wetland management activities.

Measure 6.4.1: Rehabilitation of riparian zones identified as being degraded.

Indicator 6.5: Pollution levels.

Measure 6.5.1: Number, by type, of reported pollution incidents.

Measure 6.5.2: Volume/ha of chemicals that are registered as having potentially harmful residues applied in forest management, measured annually.

This may form part of general water quality monitoring in the District and could fall under the responsibility of the Catchment Management Agency. It is however imperative that non point pollution be captured and reduced in some way and as such forestry developments should be encouraged to monitor the use of chemical pesticide and fertilizer and potentially substitute these with organic or biological alternatives.

Criterion 7 Forests make a positive contribution to the economy.

Indicator 7.1: Value of forest goods and services.

Measure 7.1.1: Values of timber and (Non-Timber Forest Products) NTFPs, recorded annually, and as a trend.

Indicator 7.2: Value addition to forest products.

Measure 7.2.1: Difference between the value of the forest goods and services measured at the forest gate and the value of the 'processed' goods and services, expressed as a percentage. Recorded annually as a trend.

Indicator 7.3: Forestry's contribution to the local economy.

Measure 7.3.1: Values of timber and NTFPs recorded annually, and as a trend.

Indicator 7.4: Forestry's contribution to local development.

Measure 7.4.1: Number of forestry related Small and Medium Enterprises (SMMEs) owned by local people.

Measure 7.4.2: Number and type of new infrastructure developments funded by forestry operations.

This would be difficult to monitor the collection and sale of NTFP's as much of these activities are informal. It would however in the future be valuable to determine the value derived from these products as this would indicate the true value of the forestry resources to both the commercial companies and the local people. The information regarding timber should however be easily gathered if the felling is formal and organised.

Criterion 8 The forest economy is resilient.

Indicator 8.1: Diversification within the forest industry.

Measure 8.1.1: Number of different species and clones cultivated.

Measure 8.1.2: Range of goods produced from the FMU (Forestry Management Unit).

Measure 8.1.3: Range of participants involved in the production of goods in the forest sector.

Measure 8.1.4: Range in scales of production.

Indicator 8.2: Staff turnover in forest based businesses.

Measure 8.2.1: Number of people that leave an organisation within a year expressed as a percentage of the total staff compliment – trend from year to year.

Indicator 8.3: Taxes, levies and charges paid by forestry.

Measure 8.3.1: The burden of taxes, levies and charges expressed as a proportion of total operating costs.

This information should be readily available from the organisation it would just be a matter of the municipality collecting and monitoring it.

Criterion 9 People have rights to access and use of forests.

Indicator 9.1: Opportunities for forest based activities.

Measure 9.1.1: Types of activities taking place around a FMU related to the forest.

Measure 9.1.2: Impacts of activities.

Measure 9.1.3: Number of forest user groups according to their resource needs/uses.

Measure 9.1.4: Inventory of forest resource use needs.

Measure 9.1.5: Area accessible to user groups.

Indicator 9.2: Rights are understood and respected.

Measure 9.2.1: Incidence of conflict between forest managers and owners and people practicing their rights.

This would only apply to plantations where the local people have been granted the right to utilise different NTFP's within the plantations.

Criterion 10 Forests are used responsibly.

Indicator 10.1: Control and enforcement of access and use.

Measure 10.1.1: Number of reported infringements of access and use.

Criterion 11 Land tenure of forest areas is clearly defined, recognised and secure.

Indicator 11.1: Security of land tenure.

Measure 11.1.1: Number of disputes over land or resource.

Measure 11.1.2: Number of land restitution claims on forested lands that are resolved.

Criteria 10 and 11 relate more to community plantations than commercial forestry. However infringements on access to commercial forestry would indicate the need by local people for wood. As such if illegal removal of trees should be monitored and if this persists reasoning should be sought. This may be indicative of a lack of wood or energy resources for local rural people.

Criterion 12 Cultural, ecological, recreational, historical, aesthetic and spiritual sites and services supplied by forests are maintained.

Indicator 12.2: Identification and registration of significant sites.

Measure 12.2.1: Inventory of significant sites.

Indicator 12.3: Condition of sites of significance.

Measure 12.3.1: Satisfaction of relevant stakeholders.

This relates more to indigenous forests however plantations should not be established in or near areas of significance and as such these areas should be identified prior to development of plantation as part of the EIA process.

Criterion 13 The distribution of employment benefits from forests is fair.

Indicator 13.1: Employment opportunities associated with forestry.

Measure 13.1.1: Percentage of labour force employed from local areas.

Measure 13.1.2: The race and gender distribution within the occupational categories of the forest enterprise.

Indicator 13.2: Employer compliance with labour legislation.

Measure 13.2.1: Number of cases where labour legislation has not been complied.

Measure 13.2.2: Number of labour related conflicts in the industry.

Indicator 13.3: Remuneration of workers.

Measure 13.3.1: Ratio of wage levels to productivity.

Measure 13.3.2: Wage rates within the sector or industry.

This is closely related to the sustainability of commercial forestry. To improve economic development of the District these indicators must be monitored. Employment information should be available from the employers and employees should be educated as to their rights so that they may act as watchdogs and report their employers or others that do not comply with labour legislation. Companies should be approached to allow workshops to take place and any not willing should be more carefully monitored.

Criterion 14 The distribution of the costs from forestry is fair.

Indicator 14.1: Negative impacts of forestry activities on people.

Measure 14.1.1: Inventory of impacts: noise, water quantity, water quality, soil contamination, alien vegetation, problem animals, sense of place, aesthetics, number of forest related accidents.

Measure 14.1.2: Number of people/households who are negatively impacted upon by forestry activities.

Indicator 14.2: The spatial distribution of forests in relation to vulnerable communities.

Measure 14.2.1: Number of plantations adjacent to vulnerable communities.

Measure 14.2.2: Number of vulnerable households per hectare of forest.

Indicator 14.3 The costs of negative impacts.

Measure 14.3.1: An assessment of costs reflected in financial accounts (or budgets).

Indicator 14.4: Discontinuation of forest activity.

Measure 14.4.1: The plans are in place to deal with the social and economic impacts of the discontinuation of forestry in an area.

Indicator 14.5: Conflict over distribution of costs.

Measure 14.5.1: Number and nature of conflicts over the distribution of the costs of forestry.

This should be included in the EIA of any new development however it would be difficult to assess these indicators for existing forestry operations. It may however be possible to identify issues and conflicts associated with forestry through the environmental forum.

Criterion 15 Crime in forestry areas is minimised.

Indicator 15.1: Incidence of crime.

Measure 15.1.1: Number and type of incidents of crime.

Indicator 15.2: Cost of security.

Measure 15.2.1 Cost per hectare spent on security.

As mentioned above this will indicate needs of the local communities and their perceptions of the forestry operations.

Criterion 16 Forestry contributes to the reduction of HIV/AIDS and its resultant impacts.

Indicator 16.1: Absenteeism.

Measure 16.1.1: Percentage of employees absent from work measured as a trend.

Indicator 16.2: HIV/AIDS management strategies.

Measure 16.2.1: Evidence of implementation of an HIV/AIDS strategy.

This information would be easy to gather and companies should be encouraged to initiate AIDS awareness programs.

Criterion 17 There is effective stakeholder participation in forestry management.

Indicator 17.1: Effectiveness of participation.

Measure 17.1.1: Existence of participation process involving stakeholders.

Measure 17.1.2: Stakeholder identification and list of stakeholders.

Measure 17.1.3: Representation of all stakeholder groups, including disadvantaged and marginalized groups, in the participation process.

Measure 17.1.4: Frequency of participatory interactions.

Indicator 17.2: Implementation of outcomes of participation.

Measure 17.2.1: Evidence of integration of outcomes of the participation process into forest management.

Measure 17.2.2: Percentage of forest area with management plans that have included participation processes.

Indicator 17.3: Capacity to participate.

Measure 17.3.1: Evidence of active participation.

Measure 17.3.2: Evidence of capacity building processes.

Measure 17.3.3: Availability of information in non-scientific format that is understandable to stakeholders in the participation process.

Indicator 17.4: Conflict management

Measure 17.4.1: Number of resolved conflicts arising from participation as a proportion of number of conflicts identified.

Measure 17.4.2: Number and type of complaints received regarding management.

Measure 17.4.3: Incidence of conflict regarding fulfilment of responsibilities.

This would relate to community forest initiatives and in the establishment of a new forestry development.

Criterion 18 Forests are developed and managed so that persons or categories of persons disadvantaged by unfair discrimination are advanced.

Indicator 18.1: Awareness among disadvantaged persons of forest management opportunities.

Measure 18.1.1: Number and nature of special initiatives to inform disadvantaged persons of forest opportunities.

Measure 18.1.2: Languages used to communicate special initiatives.

Measure 18.1.3: Media used to communicate special initiatives to disadvantaged persons.

Measure 18.1.4: Number of applications to take up special opportunities made by disadvantaged persons.

Indicator 18.2: Generation of forest management opportunities for disadvantaged persons.

Measure 18.2.1: Number and type of special opportunities generated for disadvantaged persons.

Indicator 18.3: Realisation of forest management opportunities by disadvantaged persons.

Measure 18.3.1: Number of forest based businesses owned by previously disadvantaged persons.

Measure 18.3.2: Average income of disadvantaged households from forest opportunities.

This information would be easily gained however to improve the situation would be difficult. The municipality however should encourage (previously) disadvantaged persons to become involved in development through other strategies in the SEA (see strategies 32.33.34)

Criterion 19 People participate in forest policy development and review.

Indicator 19.1: Nature of opportunities created for participation in forest policy development and review.

Measure 19.1.1: Record of the number and type of opportunities created for people to participate in national forest policy development and review.

Measure 19.1.2: Record of the number and type of opportunities created for people to participate in provincial forest policy development and review.

Indicator 19.2: Stakeholder satisfaction with policy-making process.

Measure 19.2.1: Up to date information on national stakeholders; identity and contact details, specifically identifying disadvantaged stakeholders.

Measure 19.2.2: Number of complaints received by stakeholders expressing unhappiness with policy-making processes.

Indicator 19.3: Stakeholder capacity to engage in policy-making process.

Measure 19.3.1: Dissemination of relevant information by the Minister.

Measure 19.3.2: Number and origin of comments submitted on draft policies.

Measure 19.3.3: Expenditure on facilitating participation in policy development and review.

Measure 19.3.4: Number of government-funded research findings disseminated to stakeholders.

These are at a national level however Amajuba District Municipality should take part in any opportunity for public participation offered by national government to take part in policy development as the policy will affect the economic development of the district.

Criterion 20 Laws and regulations promote sustainable forest management.

Indicator 20.3: Interdepartmental cooperation in implementation of forest management laws and regulations.

Measure 20.3.5: Submission of formal reports required in terms of NFA (section 6) and NEMA (DWAF Environmental Implementation and Management Plan (EI&MP)).

Measure 20.3.6: Integrated Development Plans (IDPs in terms of the Municipal Systems Act) promote sustainable forest management.

Amajuba should ensure that as a district they cooperate with any legislation governing forestry. They should do everything possible to ensure implementation of forest management laws and regulations

Criterion 21 Forest management institutions comply with all relevant legislation and customary law.

Indicator 21.1: Awareness and understanding of forest management legislation and customary law.

Measure 21.1.1: Number and type of training and education programmes on forest management laws and regulations for stakeholders.

Measure 21.1.2: DWAF budget for public awareness campaigns in Amajuba on forest management laws and regulations.

Indicator 21.2: Capacity of regulatory and management institutions to comply with forest management legislation and customary law.

Measure 21.2.1: Budget for DWAF component dealing with forest regulation.

Measure 21.2.2: Government spending on training and capacity building for forest management personnel.

Measure 21.2.3: Time taken to process applications for Stream Flow Reduction Activities, NFA section 7 harvesting and cutting, EIA (Environmental Impact Assessment) permissions in terms of the ECA (Environment Conservation Act) and other forest-related licenses.

Measure 21.2.4: Number of personnel and amount of funding per hectare transferred by DWAF to new management bodies (to which forest management responsibility is transferred).

Measure 21.2.5: Annual forest management budget of new management body, broken down by category of new management body.

Indicator 21.3: Capacity of research institutions to support sustainable forest management.

Measure 21.3.1: Amount of funding for forest-related research.

Measure 21.3.2: Number of refereed articles on forestry in accredited journals.

Measure 21.3.3: Number of new forest patents generated in SA.

Indicator 21.4: Capacity of education and training institutions to support sustainable forest management.

Measure 21.4.1: Amount of funding for forest education and training institutions.

Measure 21.4.2: Inventory of forest education training institutions and programmes offered.

Measure 21.4.3: Supply of trained forest personnel, by qualification and demographic mix.

Indicator 21.5: Compliance with forest management legislation and customary law.

Measure 21.5.2: Number of fines and prison sentences imposed for committing forest management offences.

Measure 21.5.3: Number and type of incentives provided to encourage compliance with forest management laws.

Measure 21.5.4: Regularity of forest managers' submission of DWAF's Annual Timber Plantation Statistics Census Form.

This relates more to the national indicators however Amajuba should be aware that funding and research is available to you if there is a need.

Criterion 22 Forest policy is subject to periodic review.

Indicator 22.1: Monitoring of forest policy implementation.

Measure 22.1.1: Analyses of forest policy implementation included in reports required in terms of NFA (section 6) and NEMA (DWAF EI&MP).

Measure 22.1.2: Processing of forest managers' statistical returns by DWAF.

Indicator 22.2: Review of forest policy.

Measure 22.2.1: Revision and updating of NFP.

Again this relates to the national setting of policy however Amajuba should participate wherever possible in the review process.

Criterion 23 Forest management planning promotes sustainable use and development of the forest resource.

Indicator 23.1: Forest management planning.

Measure 23.1.1: Quality of FMU management plans.

Measure 23.1.2: Percentage of FMUs with management plans.

This should be monitored as part of the EIA process however for old developments that predated the EIA legislation there should be further investigation. Environmental certification however would make the product more competitive on the international market and insure that environmental costs, where possible, are internalised.

Criterion 24 There is national and provincial strategic planning for forest management.

Indicator 24.1: DWAF's national strategic plan for the forest sector (i.e. the NFP).

Measure 24.1.1: National strategic management plan for forestry.

Indicator 24.2: National forest sector strategic plans

Measure 24.2.1: National strategic plans for major organisations representing the forest sector, including those concerned with both commercial forestry and natural forest conservation.

This is again more on a national level however Amajuba District Municipality should wherever possible participate and give input into the drafting of plans.

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Chapter 5 Management Recommendations for Sustainable Agriculture

5. AGRICULTURAL LAND POTENTIAL

Climate, slope and soil conditions in combination determine the agricultural land potential of a site or region. This information can be accessed through the use of identified Bioresource units. The recommendations for individual Bioresource units have not been listed here however they may be accessed from the Natural Resources division of Cedarburg. This information is not included in this report as there are approximately 50 Bioresource units within the District and each have their own recommendations in terms of yields of various crops. Broad categories have been used to map the agricultural land potential of the district. These relate to the limitations of the land in terms of agriculture and recommendations for management and potential development in the areas. They include the following categories:

Land Potential	Limitations due to slope soil temperature or rainfall	Recommendations
Very High	None	Appropriate contour protection must be implemented and inspected. Should not be utilised for forestry
High	Very infrequent/ Minor	As above
Good	Infrequent/ moderate limitations	As above
Moderate	Moderately regular/ severe	Appropriate permission is required before ploughing virgin land
Restricted Potential	Regular/ moderate to severe	Potential for some crops but other options should be investigated.
Very restricted	Regular/ severe	Non arable, potential for tourism should be investigated, potential game ranching opportunities
Low	Severe	Non arable, potential for tourism should be investigated, potential game ranching opportunities
Very Low	Very severe	Non arable, potential for tourism should be investigated, potential game ranching opportunities

None of the last three categories correspond on the mapping to areas that have a high irreplacability index or have large areas covered with wetlands this would indicate that these are areas that have steep slopes and high altitude. These areas would be ideal for ecotourism ventures such as abseiling and hiking as they would offer good views and areas for climbing.

Other generic recommendations for sustainable agriculture are listed below.

5.1 Conserve and Create Healthy Soil

- Stop soil erosion by terracing, strip cropping, repairing gullies
- Add organic matter to soil (with "green manure" cover crops, compost, manures, crop residues, organic fertilizers)
- Conservation tillage
- Plant wind breaks in the form of indigenous trees
- Rotate cash crops with hay, pasture, or cover crops

5.2 Conserve Water and Protect Its Quality

- Reduce use of chemicals
- Establish conservation buffer areas near sensitive areas such as wetlands and indigenous forests
- Grow crops appropriate to the soil type and climate
- Use efficient irrigation methods

5.3 Manage Organic Wastes and Farm Chemicals So They Don't Pollute

4.3.1 Organic wastes:

- Test soil and apply manures only when necessary
- Compost organic waste
- Store litter piles out of the rain and snow
- Raise pastured or free-range poultry, negating the need for waste disposal
- Raise hogs in hoop houses or free-range as above

5.4 Farm chemicals and trash:

- Look for alternatives to chemicals
- Use the minimum dosage if chemicals are the only option
- Buy the least toxic chemical
- Recycle where ever possible
- Always dispose of containers ect according to label instructions

5.5 Manage Pests with Minimal Environmental Impact

- Use of narrow spectrum, least-toxic herbicides
- Ensure sprayers are correctly calibrated
- Use application methods that minimize amount of pesticide used, drift, and farmer contact.

- Introduce or enhance existing populations of natural predators, pathogens, sterile insects, and other biological control agents.
- Maintain wild areas or areas planted with species attractive to beneficial insects
- Encourage crop rotation and intercropping (strip cropping)
- Maintain healthy soil (prevents soil-based diseases) and encourage the use of ectomycorrhiza to improve nutrient and water uptake
- Keep plants from becoming stressed, by providing the right conditions in terms of soils and water

5.6 Select Plants and Animals Adapted to the Environment

- Grow crops and crop varieties well-suited to climate
- Match crops to the soil
- Experiment with older, open pollinated varieties that do well without chemical inputs
- Raise hardy breeds of livestock adapted to climate
- Raise livestock that gain well on grass and native forages

5.7 Encourage Biodiversity

(of domesticated animals, crops, wildlife and native plants, microbic and aquatic life)

- Diversify types and genetic make up of crops and livestock raised
- Leave habitat (field margins, unmowed strips, pond and stream borders, etc.,) for wildlife
- Maintain the health of streams and ponds
- Provide wildlife corridors
- Rotate row crops with hay crops

5.8 Conserve Energy Resources

- Reduce number of tillage operations
- Decrease where possible the use of chemicals and fertilizers
- Develop production methods that reduce horsepower needs
- Recycle used oil
- Use solar-powered fences and machines where possible
- Use renewable, farm-produced fuels: ethanol, methanol, fuel oils from oil seed crops, methane from manures and crop wastes

5.9 Increase Profitability and Reduce Risk

- Diversify crops and livestock
- Substitute management for off-farm inputs

- Maximize the use of on-farm resources
- Work with, not against, natural cycles
- Keep machinery, equipment and building costs down
- Add value to crops and livestock
- Try direct marketing (subscription farming, farmers' markets, farm stores, mail order)

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Chapter 6 Management Recommendations for Built Environments

The land use management systems and schemes for the built environment deal with most of the potential environmental impacts. Strong environmental management systems are in place within these schemes and are enforced via the development authorisation process. However two areas are limited in their coverage Air and water pollution as a result of industrial and mining processes.

6.1 Air Quality Management

In order to obtain more detailed information on the level and content of emissions within the region (from vehicles, businesses, homes, industries), mitigation measures for various development scenarios, the location of the problem and its potential impact on air quality in the identified areas of local concern (such as industrial emissions), a detailed **specialist study** would be required. (see SEA business plans).

6.1.1 This Specialist Study/Air Quality Report would be based on an analysis of monitored local gas emissions:

6.1.1.1 eg. Sulphur Dioxide (SO₂) - industrial emission indicator, Carbon Monoxide (CO) - motor vehicle emission indicator and Nitrogen Oxides (NO_x) - both industrial and motor vehicle emission indicator- "Criteria pollutants" - forming the basis for the compilation of an emissions inventory. Carbon monoxide, nitrogen oxide and hydrocarbons - precursors to photochemical smog of which the pollutant ozone is the chief constituent. Diesel utilised in South Africa contains a higher sulphur content than elsewhere in the world - (0.55%) and may be a contributory factor to SO₂ levels. (DMA Air Report, 1995).

6.1.1.2 National Guideline Values - as a basis for establishing exceedances and World Health Organisation standards for more stringent control.

6.1.1.3 Carrying capacity "the ability of a system to assimilate a substance without degrading or damaging that system"

6.1.1.4 Dispersion Modelling - comparison of both predicted and monitored data.

6.1.1.3 Conclusions/Recommendations and proposed Mitigation Options.

A report of this kind would identify the consequences of current (minimal) industrial activities and on-road traffic movement on air quality in the Amajuba area specifically Newcastle. The potential impact of development proposals could also be addressed through Dispersion Modelling techniques.

6.1.2 It is imperative that an Air Quality data basis (emissions inventory) be established as a platform for the calibration of acceptable/unacceptable pollutant levels (specific regional standards to adhere to) in the Amajuba District Council. The ongoing recording of emissions data would require the development of an Air Quality management framework linking emission levels to:

6.1.2.1 The need to ensure and maintain public health and reduce risk and nuisance to public (cumulative effect of various emissions), and

6.1.2.2 Environmental sustainability (future economic, industrial, transport, housing development etc. to the benefit of all through effective planning and management),

6.1.2.3 Analysis of the emissions inventory data Ψ suitable mitigation measures.

The following key strategies are provided as a broad outline of areas to be further investigated, among others, in the recommended detailed specialist air study.

6.1.2 Outline of strategies for control of harmful emissions - Air Quality Management Plan

6.1.2.1 Technological Control - emissions monitoring

6.1.2.1.1 Establish and proceed on an ongoing basis with source emission inventory: eg. SO₂, CO, NO_x and other significant pollutants - expand to cover others (cumulative effects of "cocktail") taking into account industrial development scenarios - all relative existing air quality information to be incorporated.

6.1.2.1.2 Measure and monitor emissions from industries - Diffusive (passive) samplers, continuous gas analysers and "bubblers".

6.1.2.1.3 Incorporate data from passive samplers as well as that provided by the bubblers into the analysis process.

6.1.2.2 Mitigation Measures:

6.1.2.2.1 Benefit in the *concentration* of new industrial growth as opposed to scattered zones. Negative impacts from industrial emissions "confined" together with vehicular emissions. (Due cognisance of accumulative impact areas & areas of risk).

6.1.2.2.2 Promote the reduction of SO₂, NO_x, CO emissions through various measures (fuel substitution, eg. coal Ψ natural gas, electrified furnaces, increasing stack heights where appropriate, combustion modification in processes & post-combustion control). Undertake dispersion modelling to indicate impact of increased stack heights, and where appropriate, allow their installation.

6.1.2.2.3 Promote reductions at source by encouraging technological changes, alternative processes, boiler restrictions etc.

6.1.2.2.4 Continue and extend monitoring of emission levels. Continue to enforce reduction in emission levels. Establish and update emissions data base, modelling for SO₂ and other pollutants, taking into account industrial development scenarios.

6.1.2.2.5 Educate smaller industries on "clean air" procedures and appropriate technologies.

6.1.2.2.6 New industries to have SO₂ emission reduction technology that will effectively enable them to keep within ambient air guidelines before locating in the area.

6.1.2.2.7 Undertake detailed investigations of specific air quality issues.

6.1.3 Strategies for control of vehicular emissions - (traffic control)

6.1.3.1 Mitigation Measures:

6.1.3.1.1 Promote reduction in vehicle emissions by encouraging adoptions of technological changes (three way catalytic converters, particulate traps, after-burners in exhausts, and fuel injection systems).

6.1.3.1.2 Traffic Loading - The benefits of catalytic converters in an area are however offset by an increase in the number of vehicles therefore a long-term management plan to reduce traffic loading is necessary. Eg. Promote reduction in vehicle emissions by encouraging increased use of public transport, car pooling, etc.

6.3.1.3 Restriction of Traffic movement during periods of poor dispersion.

6.1.4 Legislative Control:

6.1.4.1 The principle of “the polluter pays” - White paper on Environmental Policy for South Africa now the National Environmental Management Act, 1998 (107 of 1998),

6.1.4.2 Formulate policy regarding emissions levels acceptable to public health.

6.1.4.3 Formulate/amend and enforce Air Pollution by-laws. Using National Guidelines develop enforceable, well-defined air quality standards.

6.1.4.4 Establish steering committees/forums to take responsibility for addressing air quality issues in the area.

6.1.4.4 Control industrial developments through development approval and EIA procedures.

6.1.4.5 Increase health and safety inspections of industries and factories.

6.1.4.6 Facilitate establishment of stakeholder forum for the MLC.

6.1.4.7 Impose fines on excessively “smoky” vehicles. Erect signs within the Newcastle Municipal boundaries, warning road users of the strict legislation within the council boundaries.

6.1.5 Residential and Agricultural Controls

6.1.5.1 Mitigation Measures:

6.1.5.1.1 All residential burning of rubbish (garden and otherwise) must be prohibited.

6.1.5.1.2 Prohibition of fires within the home (use of fireplaces).

A variety of mechanisms combine to effect **air quality management** including the activities of the authorities at both local and national scale:

6.1.5.1.3 Chief Air Pollution Control Officer (CAPCO) of the Department of Environmental Affairs and Tourism (DEA&T) - exerts control through the issuing of permits for “scheduled processes”.

6.1.5.1.4 The local authority - effect control over fuel-burning appliances and the control of

smoke within the local council area. (Fuel burning appliance permits).

- 6.1.5.1.5 Reduction of agricultural waste burning, or the burning of agricultural waste only on days of suitable weather conditions, when the smoke and soot will be adequately dispersed.
- 6.1.5.1.6 Burning of low sulphur coal in winter.
- 6.1.5.1.7 Prohibition of heat exchangers in unsuitable zones.
- 6.1.5.1.8 Steering Committee to ensure that air quality management is effected in a manner that affords the necessary protection to human health and ambient air quality.

6.2 Water Quality Management

Water is a scarce, precious and basic commodity, which is vital for sustaining all forms of life. It is a major determinant of economic development and therefore wise management, fair distribution and access to water predetermines the well being of communities and nations. However, the first-world obsession with unbridled economic growth poses questions as to the durability of patterns of water consumption and lifestyle, particularly in relation to the water resources of a region.

The strong seasonal pattern of rainfall events - most of which occur in the summer months - is common in Natal. Despite being regarded as a relatively water-rich region of South Africa, fresh water supplies should be treated as a scarce commodity because rainfall is poorly distributed; irregular and evaporation losses are relatively high.

Each of the three rainfall generating systems (thunderstorms, frontal storms and major synoptic events) has a marked impact on the susceptibility of different catchment sizes to flooding from these storm mechanisms. For smaller catchments the severest floods result from thunderstorms of relatively short duration.

The wetland and river resources are dealt with in Chapter four however there is a need to address other water resources affected by development.

6.2.1 Groundwater Resources

Water law in South Africa is presently being reviewed. At this stage there is no proclamation, which alters the current situation with respect to potential exploitation of groundwater reserves. These

reserves are still considered to be private resources available to the landowner. Nonetheless a permit is required from the Department of Water Affairs & Forestry (DWA&F) if the abstraction rate exceeds 150m³d⁻¹.

The Department initiated studies of the groundwater resources in the province of KwaZulu-Natal about two years ago. The recently completed surveys have improved our knowledge of the current state of the groundwater systems in 11 separate study units. These studies revealed growing evidence of the potential contamination of the groundwater from several sources (eg human and animal sanitary contamination, agricultural practices, industrial effluents and waste disposal sites). Several deviations from the Standards for Drinking Water (SABS 241 of 1984) have been noted for bacterial contamination and nitrates. Recommendations for sustainable practices and management of the vital reserves include:-

- 6.2.1.1 proper sanitary conditions in the construction of boreholes,
- 6.2.1.2 preparation of groundwater vulnerability maps using GIS techniques,
- 6.2.1.3 Development of regional groundwater levels to assess the effect of long term abstraction on these resources,
- 6.2.1.4 proper construction and protection of springs is essential if rural communities are to have an assured supply of water from these sources.

6.2.2 Developmental Pressures

Considerable development pressures are being placed on coastal catchments from inward migration to the urban areas and from natural population increases and more recently from a trend of large industries planning to relocate near port cities. The future plans; programmes and development projects anticipated in the area must take account of the prevailing state and carrying capacity of the natural resources. It is also important to determine the opportunities for and constraints on development within the river basins in the area in relation to the dependency on and linkages with strategic environmental resources external to these basins.

6.2.2.1 Sustainable Imperatives

It is a simple but compelling principle that development within a catchment cannot be sustained by the natural resources of these basins alone **unless** development and population controls are strictly regulated. Increasing the potential for growth (development scenarios) by attracting people and

industry to these basins will therefore require sound planning and a good understanding of the impacts and threats to the natural environment in areas quite remote from these river basins.

6.2.2.2 Water Supply and Consumption Patterns

Wastage, leakage and commercial use may push consumption patterns up by an order of magnitude or more higher than anticipated for a local council. Innovative technologies, environmental awareness and good housekeeping procedures will be necessary to offset this real threat of excessive and unproductive consumption.

6.2.2.3 Waste Disposal Strategies

The scale and type of new development needs to be carefully assessed. It is therefore incumbent on the developing agencies to ensure that sustainable management practices are introduced at an early stage of policy-making for the area. Programmes and projects should be truly supportive of strategies to improve the quality of life of the prospective residents of the area without detriment to the natural river systems.

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Chapter 7 Conclusion

It is imperative that we correctly manage the land available to us. In terms of particularly sensitive areas that once developed can never be rehabilitated fully special consideration needs to be given to these areas and they should seriously considered for public open space, conservation and tourism development with key focus on impact assessment of any development.

There is large potential for agricultural development and forestry has potential in specific areas of the Amajuba district. This could provide a much-needed boost to the economy however this need should not outweigh the need to prevent environmental degradation and as such the sustainability of these practices should be closely monitored.

Air is the most basic need of any human being there is a sever need to monitor the quality of the ambient air and ensure that all registered polluters are monitored to ensure that air quality remains within acceptable norms

Water resources are extremely rare and as such should be subject to strict controls. South African legislation allows for this however it is imperative that the District individually and as a whole becomes the watchdog to prevent illegal and unethical use of water resources.

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Chapter 8 References

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