

The development of a set of sustainability indicators for the Clansthal
Conservancy's Environmental Management Plan, in KwaZulu Natal

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Preface

This thesis was completed at the University of KwaZulu-Natal, in the School of Life and Environmental Sciences between March and October 2007, under the supervision of Cathy Oelofse.

The work contained in this thesis is my own work, and where the work of other authors has been used, it has been acknowledged accordingly.

S. Hannan

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Abstract

The current rate of global economic growth combined with the rate of environmental degradation highlight the urgent need for sustainability to become an attainable goal. This is a goal which can only be reached through the efficient implementation of environmental management tools. This study focuses on the development of sustainability indicators for the Clansthal conservancy on the south coast of KwaZulu Natal, as a means of achieving greater sustainability. The Clansthal area has in place unique ecological, social, economic and governance systems which require management strategies to be implemented which will allow the area to move towards greater sustainability. A process was determined for the development of sustainability indicators and was carried out using a qualitative approach which involved the use of questionnaires and meetings with key stakeholders which identified the key issues within the area. The sustainability indicators which were developed compose of variables and measures and pertain to the ecological, social, economic and governance dimensions of sustainability. They may be incorporated into further management tools, and serve the purpose of increasing the effectiveness and efficiency of the management of the Clansthal conservancy.

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Chapter 1

Introduction

The need for the protection and management of the environment has become increasingly recognised at a global, national, regional and local scale. This recognition has occurred due to the deterioration of many aspects of global ecological, social, economic and governance environments, as the exploitation of natural resources has been combined with greed, political power struggles and a complex society. This recognition called for a system or framework which would be able to tackle environmental problems globally.

1.1. Sustainability

Sustainability was introduced as a concept to aid in the resolution of the global environmental crisis, which has arisen from the relationship between global ecology and economic development (Faber *et al*, 2005). Sustainability is linked to sustainable development, and has become the framework within which environmental management is currently approached, as the importance of the environment has increasingly been recognized, as well as the need for it be protected in the short term as well as in the long term.

Sustainability is related to the quality of life in a community, as it depends on whether the economic, social and ecological systems which make up the community, are providing a healthy, productive and meaningful life for all present and future community members (www.sustainablemeasures.com, accessed 27/03/07). The concept of sustainability is defined as consisting of four dimensions: the social, economic, environmental and institutional (Spangenberg *et al*, 2002), which are highly interconnected, and as such require management which is holistic and integrative.

Strong sustainability is an ideal which should be strived for, where the economy is seen as being encompassed by the environment (Ott, n.d.). As such, it is recognised that human action is constrained by, and dependent on, the environment; therefore demanding a relationship based on respect rather than exploitation.

1.2. Sustainability in South Africa

Many countries use sustainability and sustainable development as a framework for the way in which the environment and its various aspects are managed. South Africa, as a developing country, faces different challenges than developed countries when attempting to meet sustainability goals. This is due to the fact that the country is still in the process of developing, which poses a need for economic growth, the advancement of society, as well as the strengthening and ‘evolution’ of government. All of these circumstances provide an urgent need for sustainability to be attained, but also present a more complex and challenging situation within which sustainability must be tackled.

Sustainability must be engaged with at all levels of society in order for real progress to be made despite the unique challenges which are faced. Therefore, in South Africa, it should be dealt with at a national scale, at the scale of provinces, cities, smaller towns and villages, as well as at the level of different organizations. This will ensure that sustainability may be reached in all facets of environmental management, and at all scales. This study focuses on the Clansthal village in the eThekweni municipality, where sustainability indicators were developed for the conservancy which is actively working towards sustainability goals for the area.

1.3. Clansthal

Clansthal is an underdeveloped area on the south coast of KwaZulu-Natal, which has a wealth of natural resources and a unique sense of place (Rob Crankshaw, 10/03/07). A conservancy was formed in the area by a number of residents and other concerned individuals, and has now been operating for a number of years, with a particular vision. Conservancies are a key component in the systems of protection and conservation of biodiversity in a region (Ezemvelo KZN Wildlife, accessed 08/04/07). The Clansthal Conservancy is attempting to fulfil this role in Clansthal, through attempting to conserve the unique biodiversity of the region, and attempting to protect the distinctive value of the area through a number of initiatives, including the limitation of development.

This study is focused in the Clansthal area, and will play a key role in improving the ability of the conservancy to manage and monitor the area effectively so as to promote long term sustainability. This may be achieved through the use of sustainability indicators suggested in the study. The aim and objectives of the study are presented below.

Aim of study

To develop a set of sustainability indicators for the Clansthal Conservancy's Environmental Management Plan, in KwaZulu-Natal.

Objectives

1. To define a set of sustainability principles for Clansthal.
2. To identify critical issues in the Clansthal Conservancy.
3. To categorize these issues as ecological, social, economic or governance issues.
4. To develop a set of sustainability indicators, based on the approach used in the National set of indicators for forestry in South Africa.
5. To suggest how these could be used in the EMP.

The site of the conservancy is located adjacent to Aliwal Shoal, which is a marine protected area (MPA) (www.getawaytoafrica.com accessed 16/02/2007); and between two river systems, the Mahlongwa to the south and the Mahlongwana to the north. Due to the natural attributes which the area has, and the potential for development in the area, there are a variety of trade-offs which need to be considered when decisions concerning its future are made. There are a number of tools which may be utilized in the area which have the ability to contribute effectively to these decisions; one such tool is that of sustainability indicators.

1.4. Sustainability indicators

In order to make society more sustainable, environmental management tools are needed which are able to measure and facilitate progress towards a broad range of social, ecological and economic goals (www.sustainablemeasures.com, accessed 27/03/07). As such, the development of sustainability indicators has become a key component of international and national policy in recent years (CSIR, accessed 16/02/07).

Indicators are tools which help us to understand where we are, which way we are going, and how far we are from where we want to be (www.sustainablemeasures.com, accessed 27/03/07). Sustainability indicators are measurements used to evaluate and monitor the amount and direction of change occurring in the environment (www.sustainablemeasures.com, accessed 27/03/07). As such, the purpose of sustainability indicators is to provide a base for improved information and data collection, and to allow investigation of the state of and progress towards sustainable development in an area (Spangenberg *et al*, 2002).

Sustainability indicators are not simply tools which are used at a global or national scale. They may be effectively developed and used at a local scale, and the input of local communities is essential in ensuring that appropriate and effective indicators are developed (Yuan *et al*, 2003). Such indicators may be developed for areas within the eThekweni municipality, such as the Clansthal conservancy, providing a sound basis for monitoring and measurement of the environment, as well as for efficient decision-making.

These indicators help us to identify areas in which the link between the social, ecological, economic and governance are weak. They therefore allow us to identify and solve problems, set sustainable development goals and identify suitable management strategies for particular areas (www.sustainablemeasures.com, accessed 27/03/07). Due to these attributes, there are a number of tools which may benefit from the incorporation of sustainability indicators, such as Environmental Management Plans (EMPs).

1.5. Environmental Management Plans

Sustainability indicators may feed into a number of other important environmental management tools, such as EMPs. These play a key role in the efficient management of the environment, nationally and globally (CSIR, accessed 16/02/07). They are based on the minimisation of harm to the environment and the maximisation of compliance with environmental bodies and environmental regulations; and as such, aid us in the management of specific areas (CSIR, accessed 16/02/07).

1.6. Rationale for the study

The University of KwaZulu-Natal was requested by the Clansthal Conservancy to work with them to produce an EMP for the area, as they hope this will assist them in developing a framework to manage and control development in the area, as well as assisting them in the management of the conservancy. The research team for this project consisted of a total of four students. This particular study concerning the development of sustainability indicators will feed into the formulation of the EMP, as critical issues will be identified in this process, and the indicators provide a valuable tool to aid in management of the conservancy through the EMP. The indicators which were developed will also aid in the monitoring of issues in the Clansthal conservancy.

It is therefore a valuable study as it has provided necessary information for the creation of an EMP for an area rich in biodiversity, and valuable to the south coast of KwaZulu-Natal. It has also provided valuable sustainability indicators which can be used in the future to assess the sustainability of various facets of the Clansthal conservancy's ecological, social, economic and governance environment. This will aid in the effective management of the conservancy and will allow a basis for the argument for the protection of the area. Essentially the study will aid in the management of an environment which is crucial and valuable to the eThekweni municipality.

1.7. Chapters of the study

The study is divided into a number of chapters dealing with various aspects of the project. Following this chapter, Chapter two deals with the theoretical framework of the project, where a number of aspects are dealt with: sustainability as a concept; sustainability principles which provide the goals which must be strived for when attempting to reach sustainability; sustainability indicators which may be used as effective management tools; and thereafter some of the tools within which sustainability indicators may be incorporated, namely environmental management plans and state of environment reports.

Chapter three discusses the background of the project, describing the area of Clansthal and its location within the eThekweni municipality. The definition of a coastal system such as Clansthal is provided, and the legislation which is key to the management of the conservancy is identified. The environmental characteristics of the conservancy are explored as well as the conservancy's vision for the area. The development pressures which face the area are discussed, and the chapter concludes with the exploration of the role of the conservancy and its future.

Chapter four examines the methodology of the study, which presents how the research was undertaken. The various steps which were utilized in the collection of data, sampling, and data analysis are discussed, and the entire process is summarized in a diagram. Any problems or constraints which were encountered while carrying out the study are then presented and discussed.

Chapter five presents the results of the study, and a discussion of the results. The chapter begins with the identification of the key sustainability principles for management of the Clansthal conservancy, followed by the identification of the key issues in the area, and the substantiation for the choices thereof. The issues are thereafter categorized into the four dimensions of ecological, social, economic and governance, and indicators and measures are provided for each of the issues. The chapter concludes with the suggestion of how the sustainability indicators can be incorporated into an EMP.

Chapter six discusses the conclusion of the study. The underlying ideas of the project and the process of the indicator development are summarized in this chapter. Thereafter, the process of indicator development, particularly for a specific area, is critically reflected upon. Some of the strengths and weaknesses of the sustainability indicators which were developed are then examined, and the chapter concludes with a discussion of how the indicators may be used in order to ensure the efficient and effective management of the Clansthal conservancy.

Chapter 2

Conceptualizing sustainability indicators

The theoretical framework discusses the concept of sustainability as an important component of environmental protection and management in today's society. This is followed by an examination of some important sustainability principles from a number of sources, including the framework environmental legislation in South Africa. An overview of sustainability indicators and their importance is presented and explored, in terms of their role in environmental management; and finally two sections concerning Environmental Management Plans and State of the Environment reports, and the role sustainability indicators may play in them, are presented.

2.1. Sustainability

This section deals with the concept of sustainability, its importance and some of its key tenets, including its composition of the four dimensions of the social, environmental, economic and institutional.

The concept of sustainability as a term was introduced as a framework, within which, the many challenges which have arisen from the relationship between global ecology and economic development may be tackled. This relationship has been deteriorating over time, and as such, a number of severe environmental problems have arisen (Faber *et al*, 2005). Sustainability is a multi-faceted concept, which is understood and defined differently by various people, and is therefore difficult to comprehend (Dalal *et al*, 2003; Faber *et al*, 2005). This poses a challenge when attempting to reach consensus on the best way in which sustainability may be achieved. The problems which arise from the relationship between ecology and economic development are exacerbated by the differing views of sustainability which are evident in the focus area of the study, Clansthal, challenging consensus on the best path towards it.

2.1.1. A definition of sustainability

As stated, there are many definitions of what constitutes sustainability, according to the different views held by various people. Meter (1999) suggests six defining characteristics of sustainability:

1. *Asset-based*: Begins by considering existing assets, then addresses deficiencies
2. *Engages diverse stakeholders* in respectful, mutual, flexible and open decision making processes
3. *Expresses values* that have been formally adopted by neighborhood residents
4. *Integrating*: illuminates linkages among multiple issues
5. *Forward-looking*: focuses on long-term future change, not evaluation of the past
6. *Distributional*: works toward equitable distribution of resources and wealth, not only for the current generation but also for future generations.

Although this is a definition which encompasses the views of one person, it is a definition which may be adopted or adapted in order to identify the characteristics which are most important to the concept of sustainability. This definition may be used by the Clansthal conservancy to determine their view of the key characteristics of sustainability.

2.1.2. Sustainable development

Sustainability is linked to the concept of sustainable development, which was defined in the Brundtland commission as “development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs” (WCED, 1987; cited in Hermans and Knippenberg, 2006: 302). This 1987 report began the global discussion on sustainable development. The commission pointed out that equity is a vital component of sustainability, recognizing that the earth’s ability to absorb the impacts of humans is limited and that poverty is currently one of the most significant global problems (Meter, 1999). In the Brundtland Report, three key components of sustainable development were highlighted: environmental protection, economic growth and social equity (Ghosh *et al*, 2006). These are still considered to be key components of sustainability in the present day, 20 years later.

Any debate surrounding sustainability or sustainable development, therefore, has at the core, the dilemma of “how to reconcile human social and economic activities with the long-term resilience, vulnerability and regenerative capacity of the local-global continuum of ecological systems” (Sneddon, 2000: 521). In other words, there is a key focus on the interfaces and trade-offs between the objectives of economic and social development, and environmental protection which often conflict with one another (Hermans and Knippenberg, 2006; Lehtonen, 2004). These conflicts around tradeoffs are evident in the decision-making processes in Clansthal, which is the area of focus for this research.

2.1.3. The four dimensions of sustainability

The concept of sustainability was defined in Agenda 21, as having four dimensions: the social, environmental, economic and institutional (Spangenberg *et al*, 2002). The environmental dimension of sustainability has simply been defined as the sum of all biogeological processes and their elements. The social dimension has however, been somewhat more difficult to define, with its focus on a number of elements, which include: individual human beings, their skills, their dedication, experiences and resulting behaviour (Spangenberg *et al*, 2002; Valentin and Spangenberg, 2001).

Institutions are understood as being achievements of human interaction, including organizations; as well as the systems of rules which govern interactions occurring amongst members of a society.

The economic dimension is referred to as man-made capital, and is a specific subsystem of society (Spangenberg *et al*, 2002; Valentin and Spangenberg, 2001).

Figure 2.1 shows the interconnectedness of the economic, social and the environmental dimensions as it should occur in a sustainable community. As the figure illustrates, the economy is seen as being encompassed by society, as all parts of the economy are reliant on interactions amongst people. Society is depicted as the second circle; it is seen to exist entirely within the environment, as our basic requirements are found in the environment,

such as food and water; as well as the energy and raw materials which we rely on for our daily production and consumption (www.sustainablemeasures.com, accessed 27/03/07).

The environment encompasses society, as the environment once shaped human society through the constraints and opportunities it posed for the development of societies; and is now being shaped by it. However, as people need certain elements of the environment to survive, such as food, air and water; society can never exceed the environment (www.sustainablemeasures.com, accessed 27/03/07; Lehtonen, 2004).

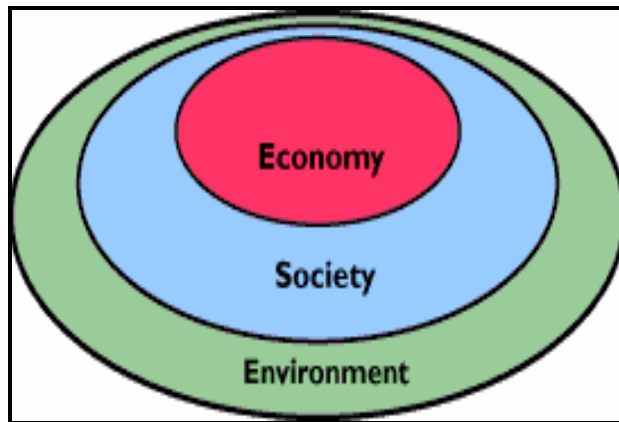


Figure 2.1: Interconnectedness of the economy, society and the environment in a sustainable community

(www.sustainablemeasures.com, accessed 27/03/07).

2.1.4. The enhancement of sustainability

The consideration of the four dimensions of sustainability is critical to its attainment and enhancement. They require careful management and utilization of their resources, and through this, sustainability may be greatly enhanced in the environment, society and the economy.

In order for sustainability to be enhanced, two key concerns can be identified:

- 1. The self-reproducing capabilities of each of the four subsystems must be enhanced, to allow for the maintenance of the systems*

Therefore, the four subsystems must be managed and nurtured in such a way that their self-reproducing capabilities are enhanced, allowing for them to function efficiently, and in so doing, maintain themselves.

2. For societies to be sustainable, ways must be found to use the four kinds of capital (societal, economic, ecological and institutional), which allows for their sustainable use, while at the same time allowing for their self-reproduction

The four kinds of capital which are to be found in any society must be utilized in such a way, so as allow them to be used, while at the same time allowing them to maintain themselves in the long term.

(Spangenberg *et al*, 2002).

It is vital that these two concerns are addressed in any community or society which is attempting to pursue sustainability goals, as the maintenance and enhancement of these four subsystems is necessary in order for long term sustainability to be achieved.

Sustainability is a complex concept, and is a goal which can be only be achieved through reaching a balance between society and the economy, and the natural environment. This balance is difficult to achieve, and it requires a set of core values or principles to be identified which may guide society towards what is ultimately desired to be achieved. The following section deals with these principles which are a critical element when moving towards sustainability.

2.2. Sustainability principles

Sustainability principles are a fundamental element of sustainability as they indicate what should be occurring in a sustainable community, and what they are ultimately aiming to achieve. They have been developed under various circumstances, and can be found in a number of sources, whether local, national or international.

2.2.1. Sustainability principles from national legislation and policy

A number of sustainability principles can be found in sources such as national legislation. The National Environmental Management Act of 1998 (NEMA) provides the framework legislation for environmental management in South Africa, and is therefore a valuable source where such principles can be found. NEMA sets out a number of principles for environmental management in Chapter 1, and a number of these pertain directly to sustainability. Table 1 shows a list of sustainability principles, which have been categorized depending on whether they pertain to the social, ecological, economic, governance spheres; or pertain to more than one sphere.

The sustainability principles for each sphere are particularly important for an area such as the Clansthal conservancy, where there is evidence of competition between the various spheres. This will allow decisions to be made based on attainment of the principles, and will ensure that each sphere is given appropriate consideration.

Table 2.1: Sustainability principles in NEMA

Ecological	Social	Economic	Governance	More than one sphere
The disturbance of ecosystems and loss of biodiversity should be avoided, or minimized.	Environmental justice must be pursued.		All interests, values and needs must be taken into account when decisions are made.	Development must be socially, environmentally and economically sustainable
Pollution and degradation of the environment should be avoided, or minimized.	The environment is held in public trust.			The best practicable environmental option should be pursued.
Sensitive, vulnerable, highly dynamic or stressed ecosystems require specific attention.				Participation of all interested and affected parties must be ensured.
				Waste should be avoided, or minimized

(DEAT, 1998).

2.2.2. Sustainability principles from local policy

Principles for sustainability can also be found in local policy, such as the 1998 Environmental Management Policy for the Durban Metropolitan Area. As these principles are part of the policy for the Durban metropolitan area, they are therefore applicable to the Clansthal area which was integrated into the municipality in 2000. The Clansthal conservancy is located within Clansthal, and these principles may therefore be applied to its management. Table 2.2 contains some of the principles which were chosen as the underpinning principles for this policy document.

Table 2.2: Sustainability principles in the Environmental Management Policy for the Durban Metropolitan Area

Common heritage	Shared responsibility
Holism	Problem solving
Considering broader consequences	Considering full environmental costs
Efficiency	Avoiding negative impacts
Public participation and access	Precaution
Continual improvement	Accountability for actions

(Common Ground Consulting, 1998).

2.2.3. Sustainability principles from literature

Sustainability principles can also be obtained from other national as well as international sources, as sustainability is a global concept and its basic principles do not differ to a great degree across countries. The following principles are relevant to any sustainable community (EPI, 1994).

A sustainable community is one which:

- a) employs ecological decision making; including incorporating environmental criteria into all municipal / government and business decision-making processes
- b) recognizes that there are some limits to growth, and that ultimately it is limited by the carrying capacity of the environment
- c) ensures the minimization of harm to the natural environment

- d) values cultural diversity
- e) makes best use of local efforts and resources, striving for local self-sufficiency and attempting to reach solutions at the local level
- f) has respect for all life forms and supports biodiversity
- g) does not compromise the sustainability of other communities
- h) does not compromise the possibilities of future generations by its activities (intergenerational equity)
- i) has shared values amongst the members of the community (promoted through sustainability education)

These principles are particularly important for an area such as Clansthal, where the community is playing a large role in attempting to reach sustainability through the actions of the conservancy.

Further sustainability principles may also be adapted from other sources. The following principles are based on the principles outlined in Local Agenda 21:

Table 2.3: Sustainability principles adapted from Agenda 21

Ecological	Social	Economic	Governance
Conservation of biodiversity and maintenance of ecological integrity	Commitment to training and capacity building of local community	Economic viability/integrity	Partnerships – government, community and the private sector
	Participation of communities in activities and decisions affecting them		Existence of monitoring and evaluation procedures
	Use of local skills and talents		
	Social justice and equity		
	Concern for future generations		

(United Nations Development Programme, n.d.).

2.2.4. The principles of justice and resilience

Sustainability principles may also be located in literature which is focused on the essence of sustainability. Hermans and Knippenberg (2006) consider two core principles of sustainability: justice and resilience. The idea of justice is explained using the concepts of John Rawls. Rawls argues that the most important premise of justice is that all primary goods should be distributed equally among members of society, unless an unequal distribution favours the least favoured members of society (Hermans and Knippenberg, 2006).

Resilience is defined as:

1. The amount of disturbance a system can absorb and still maintain within the same state or domain of attraction
2. The degree to which the system is capable of self-organization (versus lack of organization, or organization forced by external factors)
3. The degree to which the system can build and increase the capacity for learning and adaptation

(Carpenter et al, 2001, cited in Hermans and Knippenberg, 2006: 308).

A small disturbance may cause the ecosystem to shift to an undesirable state in a vulnerable system. This shift may lead to adverse social and economic consequences. However, in a resilient system, external shocks or stresses will not cause any harm to the ecological and social structures. Disturbances may even have the effect of creating opportunities for development by promoting renewal and reorganization (Hermans and Knippenberg, 2006).

There are therefore two main criteria when attempting to maintain resilience:

1. Prevent the system from moving to undesired system configuration in the face of external stresses or disturbances
2. Nurture and preserve the elements that enable the system to renew and reorganize itself following a massive change. This adaptive capacity resides in aspects of memory, creativity, innovation, flexibility and diversity of

ecological components and human capabilities (Walker *et al*, 2002, cited in Hermans and Knippenberg, 2006: 308).

The principles of justice and resilience are vitally important if sustainability is to be achieved in an area, and should therefore be included within any management strategies as goals which are to be attained.

Sustainability principles are a useful point of reference in the development of sustainability indicators, as they provide a guide for the goals towards which we should be striving. They are therefore a guide in the development of indicators which will ultimately determine whether the goals are being attained, or how far from attaining them a community is. The following section deals with these sustainability indicators. The principles which have been presented will guide in the identification of the key principles for the Clansthal conservancy which will allow them to strive towards sustainability.

2.3. Sustainability indicators

This section deals with sustainability indicators, including their link to sustainability, their importance, their development, their measurement and their use. The criteria for effective indicators are discussed, and a simple model for the development of indicators is explained.

2.3.1. The basis for sustainability indicators

Sustainable development, is a holistic concept which differs from the more traditional environmentalism, in that it includes the social and economic facets of the environment as well as the ecological facets (Guy and Kibert, 1998). It can be said to be a process, rather than a destination; as it is not a goal which is reached, but is rather a continuous endeavour. It has become an increasingly important concept, which many communities aim to achieve.

In order for sustainability to be achieved, people must be able to determine where they are in relation to their goals; this has resulted in sustainability indicators becoming used to a greater degree in environmental management (Pretorius *et al*, 2002; Reed *et al*,

2006). These indicators are being used increasingly for, among other things, the monitoring of natural resource use in order to ensure that appropriate management measures are put in place (Dalal et al, 2003). The development of sustainability indicators is useful for measuring environmental quality in Clansthal, which is the focus of this research

The need for sustainability indicators arises from the main aims of sustainable development. Sustainable development attempts to “contribute to the protection and utilization of resources by people within the regenerative capacity of the earth” (Ghosh *et al*, 2006: 263), and measurements are therefore needed in order to monitor progress towards this. Many players in society including communities, governments, businesses, non-governmental organizations, international agencies and voluntary organizations have become aware of the need to put in place a system which is able to measure, assess and report progress in terms of meeting the goals of sustainable development (Ghosh *et al*, 2006). Sustainability indicators are an ideal tool to meet these requirements.

Agenda 21, which was established at the United Nations Conference on Environment and Development, and considered to be a “blueprint for sustainability” (Ghosh et al, 2006: 264), focused on the importance of indicators for decision making and the sustainability of integrated environmental and development systems (Ghosh et al, 2006).

2.3.2. What are sustainability indicators?

An indicator is a useful way of condensing a large amount of data or complex information into a more simple explanation (Pretorius *et al*, 2002). “Indicators measure whether a community is getting better or worse at providing all of its members with a productive, enjoyable life, both now and in the future” (www.sustainablemeasures.com, accessed 27/03/07). In other words, indicators tell a community whether they are moving towards a more or less environmentally sustainable community (Olewiler, 2006). This is particularly useful in an area such as Clansthal, where environmental changes are imminent.

A good indicator informs us that there is a problem before it is beyond control, and gives us insight into what steps need to be taken in order to fix the problem (www.sustainablemeasures.com, accessed 27/03/07). Sustainability indicators do not

simply measure the condition of one environmental aspect, but may show linkages and relationships between the various sectors of sustainable development (Pretorius et al, 2002). They reflect that the dimensions of the social, economic and ecological are tightly interconnected, and are therefore required to be multi-dimensional, allowing illustration of these relationships (www.sustainablemeasures.com, accessed 27/03/07). Such sustainability indicators are vital to the sustainable development of the Clansthal area, as they will provide a greater understanding of the systems which occur within the conservancy area.

The context for sustainability differs to some degree across the globe. In developed countries, the sustainability discussion is able to be focused more on ecological topics. However, in developing countries, such as South Africa, the discussion is not only focused on ecological issues, but also on poverty and equity, as being equally important. Therefore, an indicator set must include indicators which are focused on the social, economic and governance aspects of the environment, as well as on the ecological aspects (Kemmler and Spreng, 2007). This ensures that indicators cover a more holistic idea of the environment. This is particularly important in an area such as Clansthal where all aspects of the environment are highly connected.

2.3.3. The role of sustainability indicators

Sustainability indicators are measurements which are able to monitor the amount and direction of change in the environment, and to determine whether developments or particular actions are or will be sustainable. Due to the aggregate nature of such indicators, they provide an effective tool for early detection, analysis and diagnosis of issues (Oelofse and James, 2001).

Therefore, the purpose of sustainability indicators is to provide a base for improved information and data collection, and allow investigation of the state of and progress towards sustainable development in an area (Spangenberg et al, 2002). They also indicate how well a particular system is functioning, and how to address any problems which may be encountered, allowing the appropriate action to be taken (www.sustainablemeasures.com, accessed 27/03/07). In order to allow for the communication of these indicators, complexity must be reduced to allow them to be understandable to a wide range of people (Spangenberg et al, 2002). These tools have the

ability to play an important role in the management of the Clansthal conservancy, which is the focus of the study.

A set of indicators consists of a number of individual indicators which measure important aspects of various subsystems of the whole system. These indicators are usually under the three headings, of environment, social and economy (Guy and Kibert, 1998). The indicators should be chosen so that they provide a broad overview of the entire system, taking key aspects into account; while also attempting to keep the number of indicators to a minimum. Indicators which demonstrate linkages are preferred, and they should be chosen bearing in mind the underlying principles and goals which are defined prior to the development of the indicators (Guy and Kibert, 1998).

Sustainability indicators have many roles besides that of the provision of information, such as the role they play in conflict resolution. There are many conflicts which arise from the differences in the local interests of various people. Conflicts are created between humans and the environment, economic interests and social equity, and inter-generational and intra-generational equity. There are therefore a number of criteria which indicators should meet in order to resolve these conflicts. Guy and Kibert (1998) suggest that in order to achieve this they should:

- a) *Be comprehensive:* They must attempt to provide the most information possible, and be thorough in order for these conflicts to be understood and resolved, and the best decision for all aspects of the environment to be taken
- b) *Be integrated/linked:* Indicators which address more than one aspect of sustainability (social, economic, ecological and governance), should be developed in order to understand all aspects effectively. They should also be linked to each other to enable an understanding of the situation
- c) *Address the long term:* Indicators should address the long term to ensure that all aspects of sustainability are understood over a long time period. This will ensure that the conflict is resolved, with the best option chosen for the long term sustainability of a community
- d) *Be developed by multiple stakeholders:* Multiple stakeholders should be involved in and contribute to the development of sustainability indicators. This will ensure

that all stakeholders understand, accept and trust the indicators, and will allow for more effective conflict resolution.

Sustainability indicators are able to measure changes over time and trends, and as such are able to provide real-world feedback which contributes to the various definitions of sustainability which occur at all societal levels. The feedback which these indicators supply, provides the basis for more successful decision-making which is ultimately able to improve the sustainability of a community or area. The long term feedback which the indicators should provide also allows for the consequences of these decisions, and for the accountability thereof to be determined (Guy and Kibert, 1998).

2.3.4. Effective indicators

There are a wide variety of sustainability indicators which are available or may be developed. However, not all of the indicators will be effective as they may be too broad or irrelevant to particular circumstances. A number of criteria can therefore identified which determine the effectiveness of indicators.

Effective indicators should:

- a) Be relevant, covering key aspects of sustainable development, and informing you of something you need to know*

This requires the setting of specific environmental targets and goals, in order for important environmental concerns or impacts to be addressed. Indicators serve the purpose of providing relevant information to communities which can aid them in particular courses of action

- b) Be transparent; their selection, calculation and meaning must be understandable to everyone*

The development and use of indicators must be understandable to everyone, including experts and ordinary members of society; this will assist in ensuring that they are widely used and accepted

c) Be high quality, consistent, credible and reliable, so you are able to trust the information which the indicator provides.

Indicators are used in decision making, and must therefore provide accurate information so as to ensure that the correct decisions are made and the appropriate actions taken

d) Be based on data which is accessible, in other words, the information is available or can be collected with time to act

The purpose of indicators is to provide information which promotes action; therefore the indicators chosen must be those for which there is information available that can be collected in time for appropriate action to be taken

e) Not be required to be frequently measured

Indicators provide important information, but the measurement of them is often a lengthy and complex process; it is therefore important that the indicators developed provide information which is relevant for a relatively long time period

f) Be stable in the short term to enable measurement

The indicators used must measure something which is stable in the short term to allow measurement to take place. If what is being measured is unstable in the short term, the measurements will change, and therefore the information gathered will not be accurate

g) Have the ability to be aggregated from a smaller to a larger scale

It is often easier to understand issues when they are presented at a larger scale, rather than as individual indicators which measure discrete entities; therefore it is pertinent that indicators may be aggregated to a larger scale

h) Be mappable in space and time

It is important that indicators be mappable in space and time, in order to place them within a spatial and temporal context making them easier to comprehend and monitor

i) Respond to change in management practice and provide trends over time

Indicators must be able to respond to changes in management practice, in order for them to be useful over time. They must also provide trends, in order for changes to be monitored, and for long term sustainability to be assessed

(www.sustainablemeasures.com, accessed 27/03/07; Spangenberg *et al*, 2002; Dalal *et al*, 2003; Olewiler, 2006).

Indicators are used around the globe in order to promote and direct sustainable development (Yuan *et al*, 2003). Indicators which are to be open and communicative must be simple and directionally clear. They should therefore be limited in number, and the method used for their calculation should be transparent. 'Directionally clear' refers to the indicators measuring issues directly relevant in terms of sustainability, and being able to determine progress with regard to sustainability (Valentin and Spangenberg, 2000). The criteria for effective indicators are useful in the evaluation of the most appropriate indicators for the management of the Clansthal conservancy.

2.3.5. Indicators for particular communities

It has been recognized that the implementation of regional sustainable development strategies is greatly contributed to by local communities (Yuan *et al*, 2003). This is due the fact that different areas have different needs and situations and reach sustainable development on differing paths according to their situations. Therefore local communities provide valuable information regarding their specific needs and circumstances, and they should play a key role in the development of sustainability indicators, in order for the indicators chosen to be appropriate to the particular community (Yuan *et al*, 2003). The role of communities in the development and implementation of sustainability indicators is an important aspect to consider for the development of indicators for the Clansthal conservancy.

Sustainability indicators play different roles in particular communities. For example, in a healthy, vibrant community indicators allow for monitoring so that negative trends may be identified and handled before they become problems (www.sustainablemeasures.com, accessed 27/03/07). On the other hand, communities with social, economic or ecological problems can be improved through indicators guiding them in the right direction in terms of the appropriate action to be taken to solve the problems. Indicators can also lead to discussion and a shared vision of the future for any particular community, through highlighting specific aspects of the environment (www.sustainablemeasures.com, accessed 27/03/07).

Indicators for communities should strive to:

- ❖ *Address the carrying capacity of the community in terms of natural, social, human and built capital*

This will allow for effective assessment of sustainability, where the carrying capacity of the community is not jeopardized in the long term

- ❖ *Emphasize that the economic, social and ecological well-being of a community are linked*

The links and relationships between the economic, social and ecological well-being of a community are what determines sustainability. Indicators must therefore emphasize these links in order for a true assessment of sustainability to be undertaken, and to ensure that the correct action is pursued.

- ❖ *Focus on a long range view*

Sustainability is a concept which must be addressed in the long term; sustainability indicators should therefore focus on a long range view so as to ensure that sustainability is addressed

- ❖ *Be understandable to all members of the community*

Indicators must be understood by all community members if they are to be accepted and trusted. Decision making should include community input, and therefore community members must be able to understand the indicators in order for them to become actively involved

- ❖ *Focus on local sustainability without jeopardizing global sustainability*

Indicators for communities are focused on the local sustainability of a particular community. However, they should focus on local sustainability which does not pose a threat to sustainability at a global level, as this is contradictory to the achievement of long term sustainability

(www.sustainablemeasures.com, accessed 27/03/07).

Sustainability indicators have the ability to go beyond the simple measurement of progress. They may aid in the enhancement of the understanding of social and environmental problems, the facilitation of capacity building for communities, and may assist in guiding development projects and policy. Indicators should change as

circumstances change and as communities become more involved, they should not be static over time (Reed *et al*, 2006).

2.3.6. Benefits of sustainability indicators

Sustainability indicators have a number of benefits, such as that they reduce the number of things that are measured, as well as the amount of measurements which are needed in order to be able to ascertain the sense of a particular system. From this, the health of the system may be determined, as well as any conditions which may require action to be taken (Guy and Kibert, 1998). Sustainability indicators may be said to be user-friendly, as they provide an efficient and simplified way to communicate information, making it easier for people to understand. They also serve the purpose of providing information which focuses attention on any obstacles to sustainability. They can also play a role in the assessment of the efficiency and effectiveness of projects as well as policies (Guy and Kibert, 1998).

Indicators facilitate discussion among groups in communities which may have vastly differing views, aiding in their communication through providing information which increases their knowledge. They also aid communities in identifying trade-offs which they may have to make in terms of sustainability (Olewiler, 2006). These benefits highlight the value of development of sustainability indicators for the Clansthal conservancy.

2.3.7. The development and measurement of sustainability indicators

Indicators may be developed in a number of ways. They may be variables, such as the total amount of a particular product; or they may be functions of variables, such as a ratio. They may also be qualitative variables, such as the safety of a neighbourhood; quantitative variables, such as energy use per hour; or they may be ranking variables, such as the lowest or highest of a particular parameter (Ghosh *et al*, 2006). An example of an indicator is that of an indicator species, such as the dung beetle, which can be used as an indicator of biodiversity due to their close relationship with the dung of various fauna, and their specific role as decomposers (Aguilar-Amuchastegui and Henebry,

2007). It is important to develop a wide variety of indicators in order to promote efficient monitoring and management in an area such as Clansthal.

It is important that sustainability indicators are developed in such a way that they are compatible with their intended application. For this to be achieved, statistics and raw data which are reliable are required (Pretorius et al, 2002). Indicators will differ depending on the scale at which they are developed; for local, national or global; and will also differ depending on the extent of aggregation which is employed, whether the indicators are aggregated at a small scale or at a larger scale (Pretorius et al, 2002). The choice of sustainability indicators is a human value-driven process, where the decision is made based on what is most important to particular people (Guy and Kibert, 1998).

There is no one common method of developing sustainability indicators, but there are a number of steps which appear to be common in many methodologies. This research will focus on a method for developing indicators for a local area. Firstly, the person responsible for the development of the indicators should frame their own vision of sustainability, and then identify the key issues associated with sustainable development (Kemmler and Spreng, 2007). Thereafter, the construction of a framework should be undertaken which is able to address these key issues, through organization and linking of this “sustainable development information system” (Kemmler and Spreng, 2007: 2467). The quality and usefulness of the indicators is determined by the context they are set in and what they are used for. In order for sustainability to be ensured, social, economic and ecological issues must be given equal consideration, and this should be reflected in the indicator set (Kemmler and Spreng, 2007).

A simple model for the development of indicators from issues can be represented by the following diagram. The diagram depicts a model for the development of sustainability indicators, whereby significant issues or concerns in a particular area are identified. These then become the criteria for which indicators and measures are developed. Indicators are tools which will allow the monitoring of the criteria, and measures are those tools which will allow the direct measurement of the indicators. These indicators can be based on scientific as well as local knowledge (Oelofse and James, 2001). This model will be used for the development of sustainability indicators and their associated measures for the Clansthal conservancy on the south coast of KwaZulu-Natal.

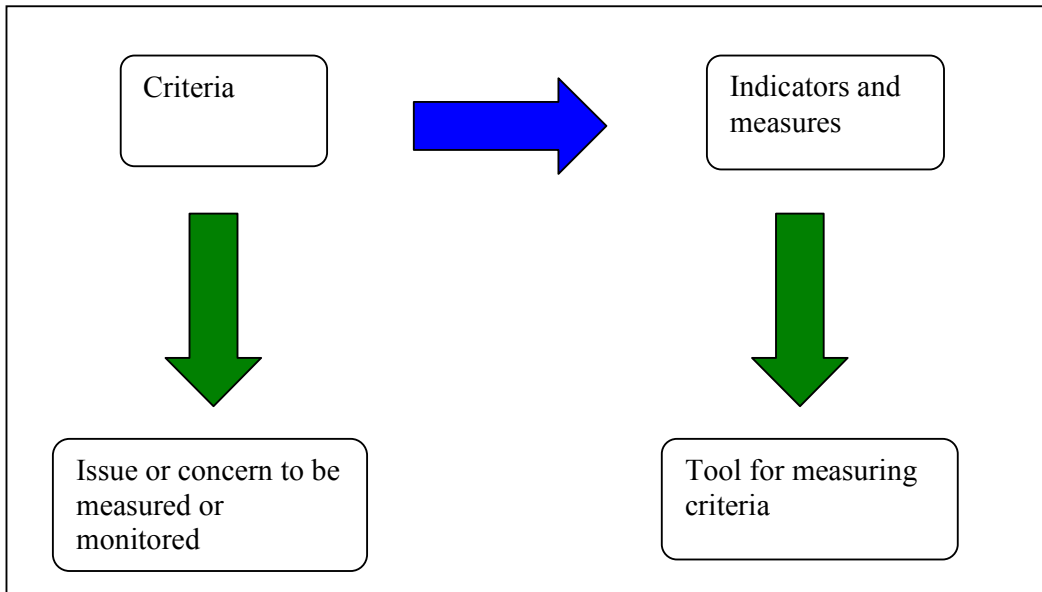


Figure 2.2: A model for the development of sustainability indicators
(Oelofse and James, 2001).

Once sustainability indicators have been developed, they must be measured in order to provide useful information. There are various ways in which sustainability indicators can be measured, including through field observation, field sampling, remote sensing, survey, or by using data which already exists (Dalal et al, 2003). By monitoring the main attributes of a particular system over time, indicators are able to show the current condition of the resource which is being used, as well as any trends which may be occurring within the resource (Dalal et al, 2003).

Sustainability indicators are important tools in the environmental field, and their significance is continuously growing as they are shown to be highly effective and useful in many circumstances. They provide relevant and timely indications of what is occurring in the environment, as well as suggesting courses of action which may be followed to correct or change certain situations. They therefore provide us with vital information concerning the functioning of all aspects of the environment. They may be used on their own, or may be integrated into other tools, such as environmental management plans and state of environment reports. The following two sections deal with these tools, and the use of sustainability indicators therein.

2.4. Environmental Management Plans

Sustainability indicators are an important tool which may be integrated into other environmental management tools, so as to enhance their value and usefulness. One such tool which is enhanced through the incorporation of sustainability indicators is an environmental management plan (EMP), which is dealt with in this section.

An EMP outlines the procedures and methods which will be utilised in achieving environmental goals (CSIR, accessed 16/02/07). It therefore outlines processes which an organization or group must take in order to minimise harm to the environment and to maximise compliance to environmental legislation and guidelines. EMPs also allow for the monitoring of progress in terms of improvements in management which may be implemented over time (Kentucky Division of Compliance Assistance, accessed 16/02/07).

An EMP involves the allocation of resources within an area, as well as allocating responsibilities to various people concerning the management of an area and its various resources (CSIR, accessed 16/02/07). It involves ensuring compliance with environmental bodies and regulations, and monitors environmental progress. Continual change and improvement is ensured through the implementation of an EMP (CSIR, accessed 16/02/07).

A number of aspects should be covered in an EMP, such as roles and responsibilities, mitigation measures, public consultation and project feedback. An EMP allocates resources, responsibilities and deadlines to each of the actions which it sets out to be undertaken. It must effectively ensure that information on impacts is collected in order to measure performance (CSIR, accessed 16/02/07).

The implementation of an EMP is a cyclical process, as it involves converting mitigation measures into actions, and through a number of steps including monitoring, review, auditing and corrective action, ensures that the actions conform to the aims.

EMPs are very useful tools in modern environmental management, and provide an effective way of managing impacts on the ecological, social and economic aspects of the environment. The integration of sustainability indicators into these EMPs greatly enhances their effectiveness through providing the key issues in particular environments, as well as providing information on what is occurring in the environment currently, and what has occurred over time. The incorporation of the sustainability indicators which have been developed into an EMP will greatly enhance their value for the Clansthal conservancy, and will ensure the best possible methods are implemented to manage the environment in the area.

2.5. State of the Environment Reports

Another environmental tool which sustainability indicators feed into is a State of Environment (SoE) report. This section discusses SoE reports, what they are used for, their fundamental tenets, and their use of sustainability indicators.

An SoE report can be compared to a report card which gives us information on the condition of the environment and natural resources. It gives us an idea of the status of a particular natural environment (Pretorius *et al*, 2002).

SoE reports are used to highlight the condition of the natural environment, as well as analyse changes and trends in these environments, the causes and consequences of these trends and changes, and the societal response which is being employed or may be employed when considering environmental problems (Pretorius *et al*, 2002). SoE reports also consider key forces which influence environmental change, as well as policies that have an impact on environmental trends (Pretorius *et al*, 2002).

The objectives of an SoE report are as follows:

1. To increase awareness and understanding of environmental trends and conditions, and their causes and consequences
2. To provide a foundation for improved decision making at all levels;
3. To facilitate the measurement of progress towards sustainability

(users.iafrica.com, accessed 02/08/07).

There are three building blocks which are essential in SoE reporting; these being, data, indicators and environmental issues. Indicators are defined as measurable properties of the environment which are usually portrayed in a spatial, temporal and policy context (users.iafrica.com, accessed 02/08/07). Seeing as most communities or societies have issues or themes which they are concerned about, it is possible to aggregate indicators within themes on issues that they describe. It is therefore important to define the priority areas of environmental concern, and thereafter identify indicators which can be used to assess conditions within these areas (users.iafrica.com, accessed 02/08/07).

There are three fundamental characteristics of SoE reports:

1. To analyze and present environmental information that can be used to assist planning and management
2. To show changes in environmental conditions over time and space
3. To show the linkages between biophysical and socio-economic factors within the context of sustainable development

(Pretorius *et al*, 2002).

In order to achieve this, a number of key questions must be asked:

- a) What is happening to the environment?
- b) Why is it happening?
- c) What are we doing about it/ what can we do about it?
- d) What will happen if we don't act now?

(Pretorius *et al*, 2002).

Sustainability indicators can assist in answering some of these questions. The first question may be answered by sustainability indicators as they measure the current state of various aspects of the environment, as well as any trends and changes that may be occurring (Dalal *et al*, 2003). They can also provide an answer to the question of what can be done about it, as they guide us in the right direction in terms of the appropriate course of action to be taken to deal with particular environmental issues (www.sustainablemeasures.com, accessed 27/03/07). Indicators may also provide answers to questions two and four, as they give us some idea of why certain situations

exist; and through their identification of past trends, they can provide an idea of what could happen if no action is taken, (Dalal *et al*, 2003).

In SoE reports, indicators are used in assessment and comparisons against goals and targets, at various scales. They are also used for forecasting and to provide early warning of the consequences of environmental management decisions (Pretorius *et al*, 2002). In SoE reports, indicators may also allow for the standardization of reporting between different areas and different spatial scales, making it easier to understand and to make comparisons. Indicators are also useful as they allow complex scientific and technical information to be presented in a simple and more effective way to those who do not have such a background (Pretorius *et al*, 2002).

SoE reports play a crucial role in understanding the current state of the environments in which we live, as well as any trends and changes which have occurred over time. They are therefore vital tools for managing the environment so as to ensure long-term sustainability. The indicators which have been developed for the Clansthal conservancy have the potential to be incorporated into an SoE report in the future, which will allow for the enhancement of the monitoring and reporting of the state of the Clansthal environment.

2.6. Summary

Sustainability is an important concept which has become a global ‘phenomenon’ in recent years, with people in all countries striving to meet sustainability goals. Sustainability principles are a key component of this move towards sustainability, providing goals which people aim to meet through effective environmental management. These principles form the basis for the development of sustainability indicators, as these indicators should provide information on whether these goals are being met or how far from meeting them a particular community is. Once these indicators have been developed, they may feed into other environmental management tools such as EMPs and state of environment reports.

The next chapter discusses the background of the study, which looks at the background of the Clansthal area, as well as that of the Clansthal conservancy. The legislation relevant to its management is presented, and the ecological components of the area are examined. Finally, the role of the conservancy and its future are discussed.

Chapter 3

Clansthal: A unique social and ecological space

This section discusses the background for the study, providing a description of the location of Clansthal within the eThekweni municipality, as well as some of its most important features. The community profile of Clansthal is described, as well as the activities and services which are available in the area. Following this, the background of the Clansthal Conservancy, for which the sustainability indicators were developed, is examined. The definition of a coastal system, such as Clansthal, is provided and the current legislation which is required to guide management in the area is identified. Thereafter the catchment status for the two rivers bordering the conservancy, and the open space assets it contains are explored. The section concludes with a discussion of the role of the Clansthal conservancy, and the future of the area in the face of increasing development pressure.

3.1. Clansthal within the eThekweni municipality

Clansthal is an underdeveloped area on the South Coast of KwaZulu-Natal, and in 2000, became incorporated into the eThekweni municipality. It is situated between the towns of Umkomaas and Scottburgh, and is located 10 km north of Scottburgh (getawaytoafrica.com, accessed 16/02/2007). Clansthal was originally bought by a German, Bernard Schikkward, as a farm, and was named after his wife's family home in Hanover, Germany (www.southcoasthappenings.co.za, accessed 23/08/07). Clansthal may be termed 'a village', as it consists of only approximately 109 houses, a number of bed and breakfasts and lodges, and a caravan park and pub (Quinn Mann, 19/08/07).

The community of Clansthal consists of a wide variety of people, some of whom have grown up in the area (John Forest, 19/08/07) and others who have moved to Clansthal from other areas, varying from local areas such as Amanzimtoti (Resident 7, 20/08/07) and Durban (Resident 3, 20/08/07); to other provinces (Resident 4, 20/08/07), and even other countries (Resident 2, 20/08/07). The community profile varies in terms of age and family structure, ranging from a number of younger families with children, to residents who are retired.

Despite this wide range of community members, they all have in common a love for the Clansthal area, albeit for a number of different reasons. One common aspect which is enjoyed by the majority of community members is the peace and quiet of the area.

As mentioned earlier, the only businesses which exist in the Clansthal area are those offering accommodation, and a pub. There are no other commercial ventures in the area such as shops, and residents must therefore travel to Scottburgh, Umkomaas or other areas if they require any commodities. Some of the houses in the Clansthal area are holiday homes, and are therefore only occupied during holiday seasons, making Clansthal a quiet and relatively private area.

As the area does not have any other commercial ventures, the activities available in the area are largely those which are linked to the natural environment, such as activities which occur in the coastal zone. These include: swimming, surfing, scuba diving, fishing and kite surfing. There are also opportunities for walking, hiking, cycling and bird watching in the area; and Crocworld is situated within approximately five minutes drive of Clansthal village.

3.2. The Clansthal conservancy

The Clansthal area has an abundance of natural resources and a unique village atmosphere. A conservancy was formed in the area, originally by a number of concerned residents with properties along the beach, and was named the Greenpoint conservancy. It was later expanded to include other permanent residents as well as some who own holiday homes, and renamed the Clansthal conservancy, which has now been operating for a number of years (Conservancy meeting, 10/03/07). A conservancy is a private conservation and environment project, which consists of a defined area of land, and is a voluntary organization with an elected committee and a constitution, with the number of members varying greatly from between 10 to over 40 members (Markham, n.d.).

The conservancy area is located between two estuarine river systems on the North and South, the Mahlongwana and Mahlongwa river systems respectively, which are named after the local tribe in the area, the Hlongwa (Pers. Comm- conservancy members, 10/03/07). A great variety of bird and marine life can be found in the conservancy, as well as mammals such as monkeys and a number of duiker (www.getawaytoafrica.com accessed 16/02/2007). The conservancy area can also be considered somewhat unique in terms of biodiversity as it consists of riverine, marine and indigenous bushland and forest (www.getawaytoafrica.com accessed 16/02/2007). It contains seven of the recognised nine biomes, which are: the sea and seashore, estuarine, dune forest, riverine forest, swamp forest, wetlands and grasslands (Quinn Mann, 19/08/07).

Alongside the conservancy, can be found Aliwal shoal, which is a protected marine habitat (www.getawaytoafrica.com accessed 16/02/2007). It is a fossilised sand dune which is comprised of a variety of sponges, hard and soft coral, and a number of warm water and cold water fish (Tourism Umdoni Coast and Country, 2001). Clansthal is therefore a highly valuable and diverse area in the eThekweni municipality, and as such, requires careful planning and management in order to ensure its long term sustainability.

3.2.1. The Clansthal conservancy as a coastal system

As the Clansthal conservancy area is located along the coastline, and between two rivers, it can therefore be said to occur within a coastal system. The coast is defined as an area with a landward and a seaward boundary that includes:

1. coastal waters, which extend from the low water mark into the sea, and up to the point where land and land- associated activities no longer influence these waters
2. the area between the low and high water marks, which is the coastline or sea shore
3. coastlands, which are inland areas above the high water mark that influence or are influenced in some way by their proximity to coastal waters (these areas may stretch many kilometres inland).

(DEAT, 2000; cited in CSIR, 2004).

Due to the classification of the Clansthal conservancy as a coastal system, it requires management measures which recognize it as such. Therefore, it should be managed as a holistic and integrated system, and not simply as discrete ecosystem units with no connections or interactions. The Clansthal conservancy committee appears to have developed a vision which satisfies such criteria, setting out objectives which provide for the holistic and integrative management of the conservancy, and focusing on the ecological, social, economic and governance aspects of management.

3.2.2. The vision of the Clansthal conservancy

The vision of the Clansthal conservancy committee is “The viable integration of human and natural resources to create a structure of interdependent growth for the future” (Clansthal conservancy, 2007). Within this vision, there are three ongoing imperatives:

1. Preservation and regeneration of the biodiversity and wildlife of existing natural areas, including the Finningley indigenous forest, the coastal dune forests, the aMahlongwa and aMahlongwana estuaries, the aMahlongwa valley, and the three beaches
2. Enhancement of part of the Marine Protected Area to full marine reserve status between and including the two estuaries, followed by a full marine regeneration programme
3. Identification, with developers, of appropriate residential development that supports the vision of integrated biodiversity **and** contributes to the economies of the community

(Clansthal conservancy, 2007).

The vision and objectives which have been developed are critical to the effective management of the Clansthal conservancy, as they present a broad framework within which management may be addressed in the area. In order to ensure that this framework may guide management and planning of the coastal system in a sustainable and efficient

way, which is in accordance with the law, the legislation which is relevant to the management of the area must be considered.

3.3. Legislation relevant to the management of the conservancy

3.3.1. International agreements

There are a number of policies and legislative frameworks which govern the management and control of all aspects of the environment in South Africa, which include international as well as national legislation. South Africa is party to a number of international agreements, which have an impact on the marine and coastal resources of the country, including:

- a. The United Nations Convention on Biological Diversity (1992)
- b. The Convention of Migratory Species of Wild Animals (1979)
- c. The United Nations Framework Convention on Climate Change (1994)

(CSIR, 2004).

3.3.2. National legislation

South Africa is also governed by a number of national legislative frameworks, such as the Constitution of South Africa, Act 108 of 1996, which sets out the right which all people have to live in a safe and protected environment. NEMA is a level below the Constitution and provides the framework legislation for environmental protection in the country, which includes a number of environmental management principles. A number of acts have been developed under NEMA which influence the management of the environment in all areas, including the coastal zone. These include:

- a. National Environmental Management Protected Areas Act 57 of 2003, which provides for the conservation and protection of ecologically viable areas
- b. National Environmental Management Amendment Act 46 of 2003, which provides for the administration and enforcement of a number of national environmental management laws

c. National Environmental Management Biodiversity Act 10 of 2004, which provides for the management and conservation of South Africa's biodiversity (CSIR, 2004).

These legislative frameworks provide guidelines for the management of all the environments in the country, including coastal environment environments, and as such, provide guidelines for the management of all areas within KwaZulu-Natal and the eThekweni municipality, including the Clansthal conservancy.

Other national legislation which will have an impact on the management of the Clansthal conservancy, includes:

a. The National Water Act 36 of 1998, which sets out 19 water management areas in South Africa, which will ultimately be managed by catchment management agencies (Glazewski, 2005).

A number of these legislative frameworks have already had an influence on the management of the environment in the Clansthal area, through policies and management strategies which have been implemented on a broad scale.

3.4. Management of critical aspects of the ecological environment in Clansthal

3.4.1. Open space assets (D'MOSS)

Open space is the term used to describe the land or water areas that contain the natural resources which are vital for sustained human development and survival, and should thus be awarded a status that is appropriate for that potential. The various types of ecosystem habitats and species that exist within open spaces are responsible for the provision of resources and the performance of functions which provide goods and services to the municipality, rendering them vital for its health and sustainability (Roberts *et al*, 2001). Open space has been recognised as an important asset of ecological, social and economic value which requires active protection, conservation and management (Roberts *et al*, 2003).

Open space assets may be disturbed or undisturbed, and include terrestrial, freshwater, estuarine, coastal and marine ecosystems, which in turn contain a number of different vegetation/habitat types. These open spaces have been identified, mapped and quantified for eThekweni a number of times, and are areas which provide critical environmental services to the city (Roberts *et al*, 2001).

In 2002, a remapping exercise of the open spaces in eThekweni was carried out, and 63 115 ha was identified as open space, 59 348 ha of which was identified as critical open space assets (Roberts *et al*, 2003), which is the portion of full open space assets that is critical in ensuring the ecological viability and sustainability of the open space system and its ability to deliver environmental services, as well as protecting the environmental services which it delivers (Roberts *et al*, 2001).

Although the Clansthal conservancy area is relatively small, it includes two river catchments which contribute to the open space assets of the eThekweni municipality. When examining the open space assets in each of the 18 catchments in the municipality, it was found that of the 2952 ha of the Mahlongwana catchment, 428 ha contain open space assets; and of the 970 ha of the Mahlongwa catchment, 261 ha contain open space assets, 14 percent and 26 percent respectively. (Roberts *et al*, 2003). Although these percentages of open space assets are not extremely high, they are nevertheless important to the municipality as all assets are key to its sustainability and health. This is due to the fact that they have the ability to provide resources and perform functions which will allow for the provision of goods and services.

Figure 3.1 shows the D-Moss areas of Clansthal, which are demarcated by the Durban Metropolitan Open Space system. The village of Clansthal is located along the south coast of KwaZulu-Natal, and is marked on the map. The Clansthal conservancy is located along the coast, between the two marked rivers, the Mahlongwa and aMahlongwana, and extends up to the N2 freeway (Conservancy meeting, 10/03/07).

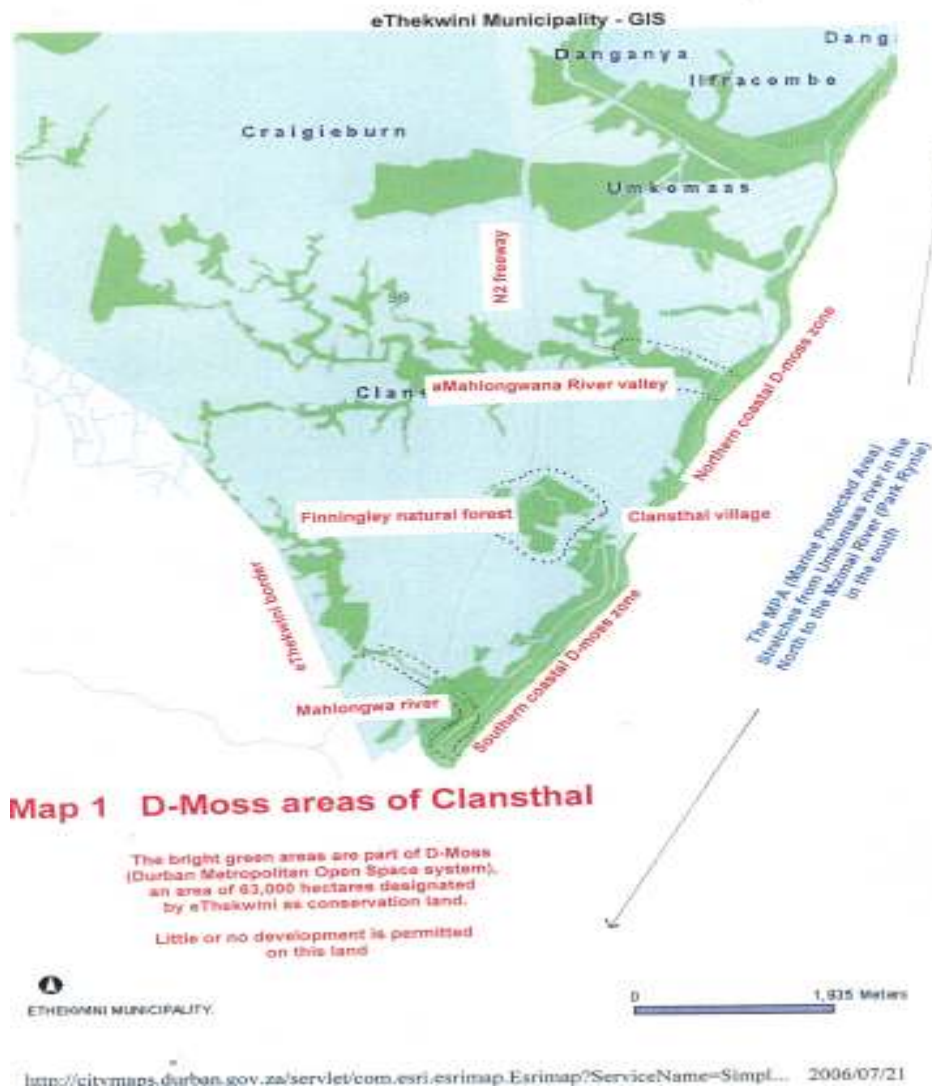


Figure 3.1: Map showing the D-Moss areas of Clansthal

(citymaps.durban.gov.za)

3.4.2. Catchment management in eThekweni

A scientific study was commissioned in 2002 by the eThekweni municipality to allow reporting on the general environmental status of the whole municipality. The catchment areas of all the rivers which run through the municipality, a total of 18 catchments, were studied, and from this conclusions were made about the resource economics of the catchments. Areas in the municipality were coloured red, orange and green depending on

their environmental health, a green catchment being one which is in a good condition and currently developed within sustainability limits (Diederichs *et al*, 2002).

The Mahlongwa and Mahlongwana rivers which border the Clansthal conservancy area were two of the only three catchments declared green in the eThekweni municipality. According to the 2002 study (Diederichs *et al*, 2002), green catchments are those which have predominantly low to moderate levels of pressure and are in a moderate to good condition. These catchments are able to cope with current levels of pressure and environmental quality remains relatively good. Management and proactive action is required in:

1. Managing areas which are providing environmental services
2. Managing current land uses
3. Proactive planning for appropriate type, location and design of new developments that will not increase the pressures on the catchment to a point where environmental quality declines

(Diederichs *et al*, 2002).

This scope for management and proactive action provides a strong basis upon which the Clansthal conservancy committee may implement their vision, and thereafter they may broaden their goals to include all aspects of environmental management.

3.5. The role of the conservancy

The conservancy is considered to have a role in Clansthal which is three fold, including the protection of natural resources, monitoring development in the area and monitoring security and crime (Rob Crankshaw, 19/08/07). The conservancy is involved in a number of ongoing initiatives, including an alien invasive removal project (Conservancy meeting, 10/03/07). The alien invasive removal project was started in the area to remove alien vegetation and introduce more indigenous vegetation, thereby protecting the natural resources of the area. A number of local people are employed in the project, and a number of residents have assisted in its implementation (Conservancy meeting, 10/03/07). This project received a large amount of success through the introduction of *pareuchaetes insulata*, a moth from Florida whose caterpillar was used to eliminate

Triffid weed, an alien species. This was considered to be the first successful biocontrol project to eliminate Triffid weed in South Africa (Conservancy meeting, 10/03/07).

The second ongoing role of the conservancy is that of “development watch dog” (Quinn Mann, 19/08/07), as the conservancy committee attempts to monitor the developments which are proposed for the area. They are currently concerned about a large residential development, the Shoals, which has been proposed for Clansthal which they feel is not suitable for the area. The third key role of the conservancy is that of monitoring crime and security, which has seen the conservancy committee employ a number of car guards in the area in an effort to reduce crime.

The role of the conservancy in the Clansthal area is therefore quite extensive, and their hope is to broaden their scope and become a highly active and successful conservancy within the eThekweni municipality (Conservancy meeting, 10/03/07).

3.6. The future of the conservancy

The conservancy would like to develop an EMP, which considers various ecological, social, economic and governance issues. This EMP will aid in the facilitation of management of the conservancy, in terms of aiding in the minimization of harm to the environment and the maximization of compliance, as well as monitoring environmental progress (CSIR, accessed 16/02/07; Kentucky Division of Compliance Assistance, accessed 16/02/07). It will also provide a basis for decisions regarding the level of development which is suitable for the area.

A large residential development called the Shoals has been proposed for the area on a 71 hectare plot of land which is currently under sugarcane. The proposed development includes approximately 240 units, a spa and a shop for the residents, with 43 percent of the land being conservation area (Narend Singh, 14/09/07). A scoping report has been concluded as well as a subsequent comments and response report, which have been submitted to the relevant authorities for review. A full environmental impact assessment (EIA) may need to be done, depending on the outcome of these two reports.

A number of issues have been raised, particularly by the conservancy committee, as to why the Shoals development should not go ahead, and also to why there should be limited development in the area. They wish to preserve the conservancy and its biodiversity, and hope to develop some of the land according to their alternative vision for the area in the future. This vision includes ecotourism, education facilities, scientific research opportunities and recreation facilities within the conservancy (Conservancy meeting, 10/03/07). The conservancy members are not opposed to all development in the area, but feel it should be development which is suitable to the area and its unique combination of biodiversity and sense of place (Conservancy meeting, 10/03/07). They would also like Clansthal to become a 'model' for other areas (John Forest, 19/08/07), where alternative development options are a success; in other words a coastal area which is not developed with estates, hotels and so forth in the way that other towns along the KwaZulu-Natal coast have been (Conservancy meeting, 10/03/07).

3.7. Summary

This section has discussed the background of the Clansthal area and the Clansthal conservancy, including the characteristics of the social and natural environment which exists in the area and the legislation which is relevant to its management. Clansthal can be considered a unique area within the eThekweni municipality, and as such requires careful management and protection in order to ensure its long term sustainability. There are however, a number of challenges facing the area, including increasing development pressure, which is one of the areas which is a cause for concern for the conservancy. In order for the best outcome for the area to be identified, a management strategy is crucial. The development of sustainability indicators has the ability to greatly contribute to a management strategy for the area, and this study therefore has the potential to contribute to the future of this irreplaceable environment.

The following section discusses the methodology which was employed in the study for sampling and the collection of data, as well as for the analysis of the collected data, and the problems which were encountered throughout the duration of the study.

Chapter 4

Methodology

This section deals with the methodology which was employed to sample, collect and analyse the data which was required for the project. The constraints or problems which were encountered while collecting and analysing the data are also discussed. The chapter is divided into four sections: data collection, sampling, analysis and constraints or problems.

4.1. Data collection

The research undertaken was action based research, as it was conducted in the field, and will contribute to an EMP for the Clansthal conservancy. Action research can be defined as 'learning by doing'. "Action research... aims to contribute both to the practical concerns of people in an immediate problematic situation and to further the goals of social science simultaneously. Thus, there is a dual commitment in action research to study a system and concurrently to collaborate with members of the system in changing it in what is together regarded as a desirable direction. Accomplishing this twin goal requires the active collaboration of researcher and client, and thus it stresses the importance of co-learning as a primary aspect of the research process" (O'Brien, 1998:1).

The research for the project was based on inductive as well as deductive methods. Initially, a theory and method were developed for sustainability indicators, which were based on a deductive approach. Thereafter, this formed a framework for indicator development which was utilised in a local area. Sustainability indicators were developed based on a bottom up approach, which involved interviewing a wide range of stakeholders in the area. This also involved the review of a wide range of data in order for the indicators to be developed. This was based on an inductive approach. The data gathered was largely qualitative due to the use of questionnaires as an information gathering tool, with the majority of questions being of a qualitative nature.

The research team for the Clansthal area consisted of four members, who were each investigating different aspects relating to the area. The research team, and supervisor, Cathy Oelofse, travelled to Clansthal on the 10 March of this year, 2007, and a first meeting was held with some of the members of the Clansthal conservancy committee. During the meeting, the members that were present discussed their role in the Clansthal area, their ideas and plans for the future, and their objections to the proposed Shoals residential development. The members of the research team were given the minutes of the conservancy committee's previous meeting as well as a number of other documents and maps, which provided information on the location and activities of the conservancy.

In order for sustainability indicators to be effectively developed, a number of sustainability principles were needed which provide goals towards which progress may be measured by the various indicators. A set of sustainability principles were therefore compiled from relevant literature; legislation, such as NEMA; and policy documents, such as the Environmental Management Policy for the Durban Metropolitan Area. Sustainability principles from each of the sources were reviewed, and certain sustainability principles were chosen based on their particular relevance to the Clansthal conservancy, in terms of those principles which should form the basis of management for the area. These principles include aspects such as justice, sustainability and precaution.

In order for questionnaires to be compiled by the research team the various stakeholders in the Clansthal area were identified. This allowed specific questionnaires to be compiled for each of the stakeholders, depending on their relationship to the Clansthal area, and the particular knowledge which they possess. It also allowed a number of questions relating to each of the research topics to be included in the questionnaires, depending on the importance of each of the stakeholders' input to each project.

Table 4.1 summarizes all of the interviews which were conducted by the research team for the project. In total, 22 people were interviewed, including 12 residents of Clansthal and 6 conservancy committee members. The research team also attended one conservancy meeting.

Table 4.1: The interviews conducted

Name	Organization/ group	Date interviewed
Rob Crankshaw	Conservancy member	19/08/07
Keith Cunningham	Conservancy member	19/08/07
Angela Kightley	Conservancy member	19/08/07
Quinn Mann	Conservancy member	19/08/07
John Forest	Conservancy member	19/08/07
Sean Chester	Conservancy member	20/08/07
Penny Croucamp	City official: Environmental Management Department	03/09/07
Andrew Mather	City official: Coastal Engineer	03/09/07
Narend Singh	Developer of the proposed Shoals Residential Development	14/09/07
Neville Hattingh	Blue Environmental Consultants	17/09/07
Resident 1	Resident of Clansthal	19/08/07
Resident 2	Resident of Clansthal	20/08/07
Resident 3	Resident of Clansthal	20/08/07
Resident 4	Resident of Clansthal	20/08/07
Resident 5	Resident of Clansthal	20/08/07
Resident 6	Resident of Clansthal	20/08/07
Resident 7	Resident of Clansthal	20/08/07
Resident 8	Resident of Clansthal	20/08/07
Resident 9	Resident of Clansthal	20/08/07
Resident 10	Resident of Clansthal	25/08/07
Resident 11	Resident of Clansthal	25/08/07
Resident 12	Resident of Clansthal	25/08/07

Thereafter, separate questionnaires were compiled for each of the stakeholder groups. These were structured questionnaires, and consisted of both open and closed ended questions. The questions which were chosen were based on literature, information

gathered from the conservancy committee members, as well as personal ideas of the research team. Refer to Appendix 1 for the questionnaires.

Plans were then made with members of the conservancy for the four students involved to visit the area over a weekend in order to conduct the research. A trip was then made to Clansthal on the 19 and 20 of August, 2007. During this trip, a number of conservancy members were interviewed, as well as a number of residents of Clansthal. Each questionnaire was conducted by one student; and for a number of the interviews, the students divided into pairs, resulting in two groups carrying out the research.

The questionnaires became highly structured interviews with the conservancy members, as they formed the basis for further discussion concerning the key issues in the area and areas which were felt to be problematic. Following this trip, a number of further visits were made to the Clansthal area in order to conduct further interviews with residents.

Appointments were then made with specialists, as well as officials in local government, including the environmental management branch of the eThekweni municipality, in order for the research team to gather information from them about Clansthal through the questionnaires. The developer of the Shoals was also interviewed by the research team, as well as a consultant from the firm tasked with the EIA for the site, Blue Environmental Consultants.

Secondary data, and other reports, including the eThekweni Catchment Management Plan, were reviewed in order to identify issues raised in them with regard to the Clansthal conservancy area. These issues formed a list of criteria, from which a set of sustainability indicators was developed pertaining to each one, under the guidance of the sustainability principles already identified.

4.2. Sampling

Sampling was done in a number of ways, with non-probability sampling methods implemented in the Clansthal population. Non-probability sampling involves the selection of the members of a population in some non-random manner (StatPac, accessed

04/09/07). Snowball sampling was initially used, primarily for the conservancy committee members. Snowball sampling involves the identification of people who meet the predetermined criteria for your study, and thereafter requesting that they recommend other people who meet the required criteria (www.socialresearchmethods.net, accessed 04/09/07). The relevant criteria for inclusion in this particular study were ascertained to be:

1. Members of the Clansthal conservancy committee
2. Residents of Clansthal

A member of the conservancy committee, Quinn Mann, was therefore contacted, and was thereafter requested to contact and set up meetings with other members of the committee, who were then interviewed by the research team. Following these interviews, two interviews were also set up with local residents with whom he was familiar. In total, six conservancy committee members were interviewed.

The majority of residents were selected using a method of convenience sampling. As many of the homes in Clansthal are holiday homes, it was difficult to ascertain which would have permanent residents. The research team therefore approached each of the properties in Clansthal, and those residents who were available and willing to participate in the study were interviewed. In total, 12 residents were interviewed.

For the local government officials, and the specialists interviewed, expert sampling was used. Expert sampling involves the identification of people with known expertise and experience in a particular area (www.socialresearchmethods.net, accessed 04/09/07). The officials and specialists were thus chosen based on their experience and expertise in specific areas, which were relevant to the areas of study of the research team, in order to elicit their views. An official was chosen in the environmental management branch in order to obtain information about the Clansthal area and its future as viewed in terms of the environmental management of the entire eThekweni municipality. An official in the planning department was also approached concerning the South Spatial Development Framework, which sets out the planning goals for the south coast.

An official from the Coastal Engineering department was interviewed in order to ascertain the value of the coastal assets in the Clansthal area, as well as the damage caused by the March storms and subsequent waves. Specialists in the environmental services approach were interviewed in order to gain information about the environmental assets in the Clansthal area, and how valuation of such assets occurs.

The developer of the proposed Shoals and the environmental consultant were interviewed as this is currently one of the major developments proposed for the area, and one which is highly debated by the conservancy committee members. Their views on the environment in the area and its development potential were thus elicited, as well as a number of the specific details of the proposed Shoals development.

4.3. Analysis

The analysis used for the project was of an inductive and qualitative nature. The process of sustainability indicator development was a complex process, involving a number of steps. The initial step in the process involved the identification of sustainability principles which were considered to be key to the management and sustainability of Clansthal, when considering its role in eThekweni and all of its attributes. These principles were identified through the review of legislation and policy, such as NEMA; as well as the review of international literature. These principles form the ‘framework’ in which the sustainability indicators fit.

The next vital step was the identification of the key issues in the Clansthal area. This was partially achieved through the use of the questionnaires which were compiled by the research team and the supervisor, and then provided a basis for the interviews of the various stakeholders. Prior discussions with the conservancy members, the review of secondary reports and other relevant literature, as well as personal ideas allowed the identification of further issues.

Following this, the issues that were identified from the various sources were divided into four categories: ecological, social, economic and governance. This allowed for the separation of the key issues into ‘discrete’ categories, in order to allow for the development of specific indicators for each category.

A set of draft sustainability indicators/ variables and their relevant measures were then developed which would allow the determination of what is occurring in terms of a specific issue in the Clansthal area; as well as allowing comparison between what is occurring and what ultimately should be occurring, indicated by the identified sustainability principles.

The draft indicators were then evaluated in order to determine which of them were essential and would be the most effective in determining the sustainability of the Clansthal area. From the draft indicators, a set of final indicators were developed which provide measures which will enable the measurement of what is occurring in the environment, and will allow the determination of whether changes in the environment over time are positive or negative.

The final sustainability indicators which were developed for the conservancy consist of a variable and one or more associated measures. The variables are those aspects which are to be measured in order to determine the state of the environment or changes occurring within it; and the measures specify the particular ways in which the measurement of each variable will be carried out. There may be a number of variables and associated measures which relate to each of the criteria. A number of variables were thus developed for each of the criteria which were identified, and thereafter one or more measures were assigned to each variable in order for them to be effectively measured, constituting a set of sustainability indicators.

Figure 4.1 illustrates the process which was followed throughout the study in the development of the sustainability indicators for the Clansthal conservancy.

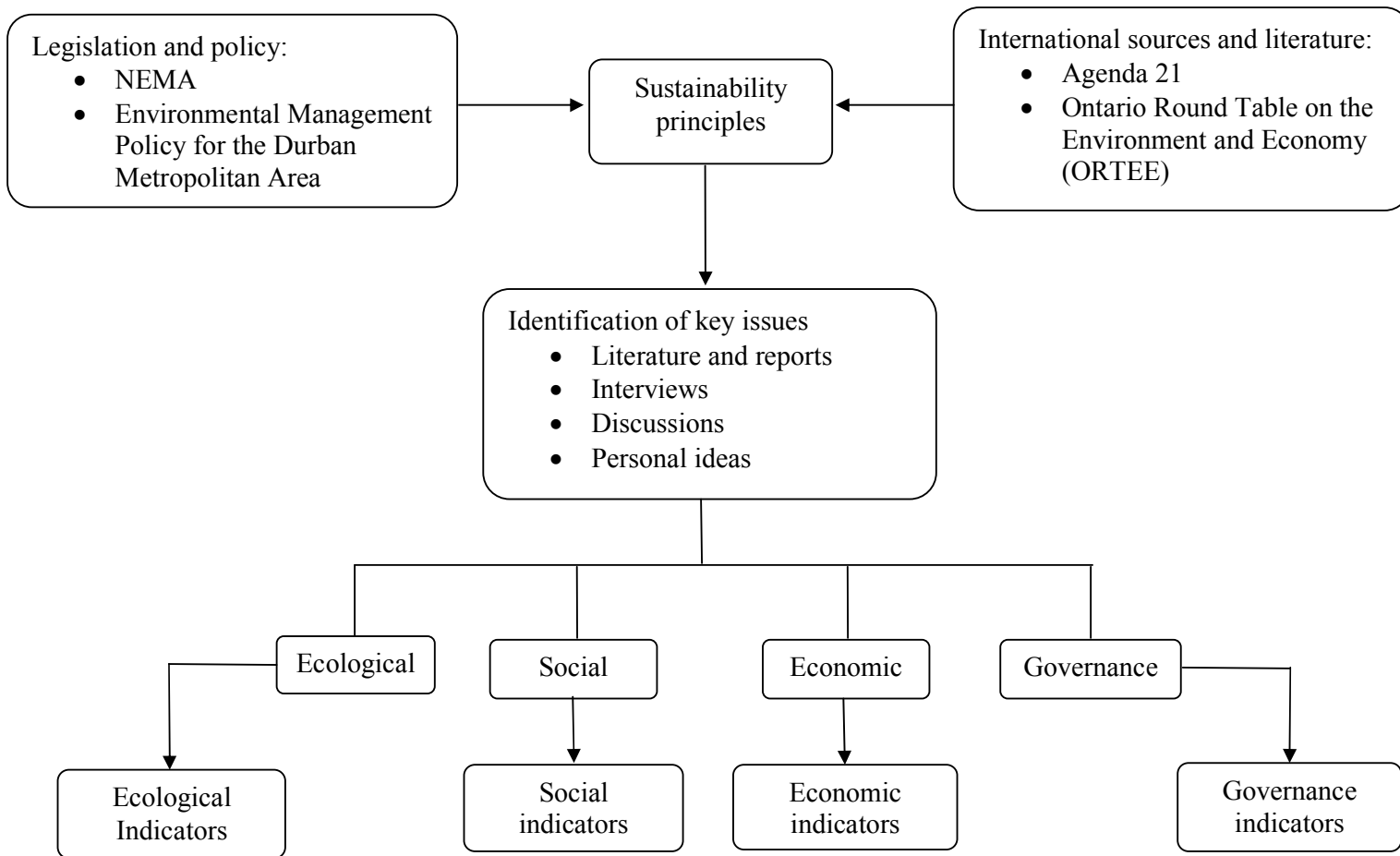


Figure 4.1: Process followed in the development of the sustainability indicators

4.4. Constraints or problems

The results of research are rarely, if ever, achieved without encountering problems; and the results are never perfect. This must be considered when doing research and the shortcomings noted in order for the merits of the project to be determined.

4.4.1. Contacting conservancy members

During the project, a number of problems were encountered by the research team. One of the problems was encountered when attempting to contact the conservancy members in order to organize a visit to Clansthal during which the questionnaires would be administered. The first attempts to contact them received no reply, which resulted in the trip being delayed for a number of weeks. Although this caused a delay in the collection of data, the research team did manage to gather the relevant information and it can therefore be concluded that it did not pose a major constraint the project.

4.4.2. Availability of residents

When attempting to interview residents, problems were encountered, as many of the houses in the area are holiday homes, and the houses were therefore empty at the time of the visit, restricting the amount of residents who could potentially be interviewed.

4.4.3. Questionnaires

Constraints may also be noted in the administration of the questionnaires, as there were a number of questions which could not be explained in different terms without providing an answer to the interviewee, making it difficult to obtain the relevant information if the question was not understood.

4.4.4. Interview process

Constraints were also encountered as the styles of the research team when interviewing differed amongst the members, resulting in questions being phrased differently or being

probed further by different members of the team. The detail of some answers were lost due to the answers being written down rapidly and in point form in order to keep up with the speed of the answers from the interviewee. These constraints however, do not threaten the results or compromise their validity, as the basis of the answers was more relevant to the study than the details.

4.4.5. Sampling

The sampling process introduced some bias, as a number of the questionnaires were administered to residents who were contacted by the conservancy members. They would therefore theoretically have similar views to the conservancy members, and therefore bias the results. This however was not a key problem, as only two residents were referred by the conservancy member, being only 16 percent of the total.

4.5. Summary

This section has presented the methodology which was used in the study. The ways in which data was collected have been discussed, as well as the various sampling methods which were used for the different groups of stakeholders. The way in which the data was analysed has been explained, and a flow diagram of the process provided. The constraints which were encountered have been discussed, and it has been concluded that they did not jeopardise the results or undermine their validity in any significant way.

The next section presents the results of the study, which include the identification of the key sustainability principles for the Clansthal conservancy, the identification of the key issues which were identified and the presentation of the indicators and their measures which can be used in a tool such as an environmental management plan to measure and manage the environment in Clansthal.

Chapter 5

Results and Discussion

This section presents the findings of the study and a discussion thereof. The sustainability principles which were considered to be key to the management of the Clansthal conservancy are presented. Following this, all of the key the issues which were identified through the interviews and discussions with stakeholders, as well as the issues which were found in the literature and those which were personal ideas, are categorized into ecological, social, economic and governance issues. Thereafter a number of the key issues are discussed in further detail. The development process of the indicators is then discussed, and the final indicators for the ecological, social, economic and governance dimensions of sustainability are presented. The chapter concludes with a discussion of how the indicators may be incorporated into an EMP in the future, which can then be used in the management of the Clansthal conservancy.

5.1. Key sustainability principles

When sustainability is considered at any level, whether for a country, a province or even at a smaller scale, such as a town or village, it is important that a number of principles form the underlying basis for monitoring and management. Sustainability principles which are key to the sustainability of a specific area are therefore identified. These become the goals towards which the environmental management of the area must strive in order for long term ecological, social, economic and governance sustainability to be ensured.

The principles which are chosen for a specific area must therefore pertain to all spheres of the environment in order to allow for the most effective and efficient management system which will ultimately ensure sustainability for the area. The Clansthal conservancy may be considered in the same way, as it occurs in a specific area and therefore requires a number of sustainability principles which are vital to its sustainability to be determined. Figure 5.1 presents a diagram showing the process which was followed in order to ascertain the key sustainability principles for all dimensions of the environment in the Clansthal area.

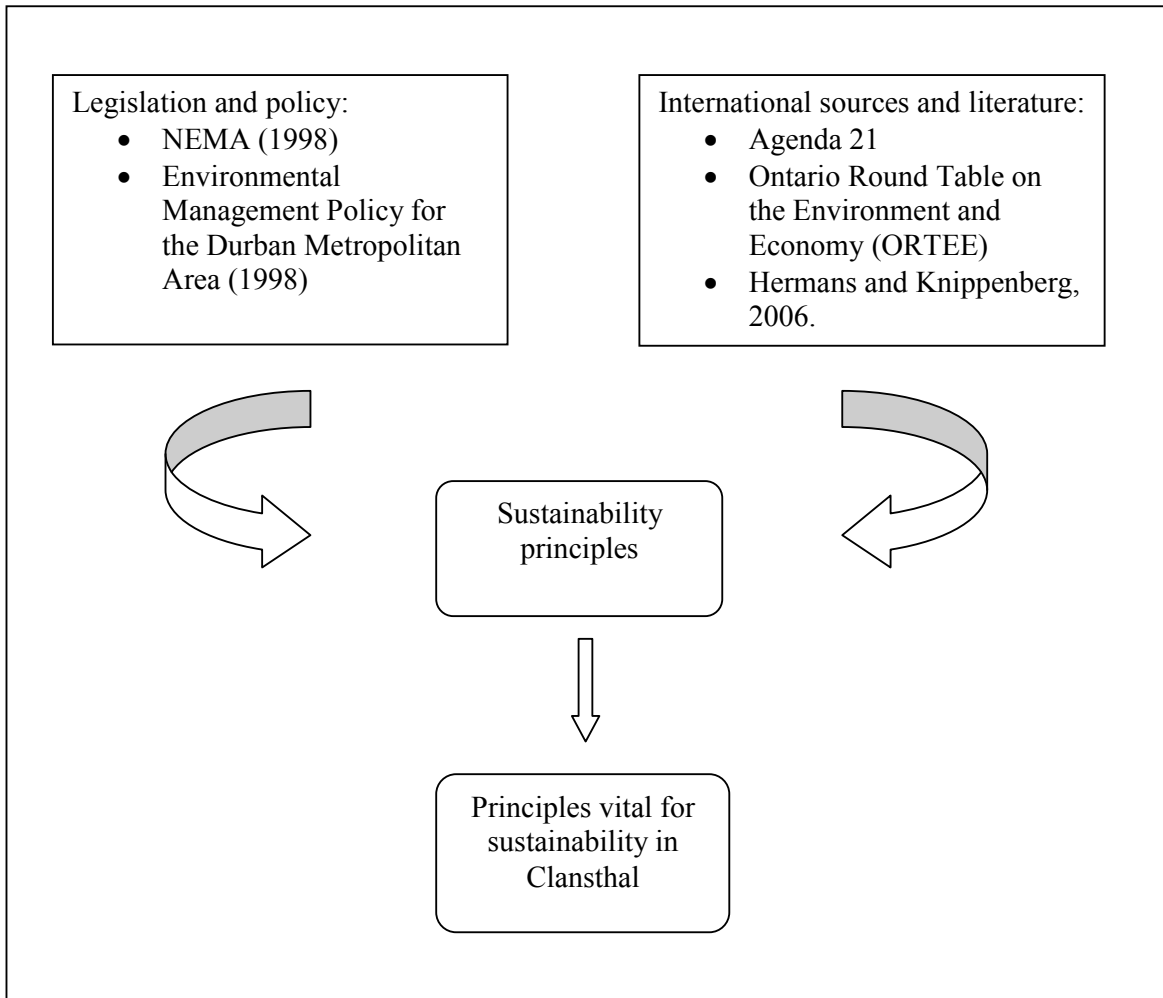


Figure 5.1: Process for the identification of the vital sustainability principles

In order for the most vital sustainability principles for the Clansthal conservancy to be determined, a number of sources were reviewed. These included policy, such as the Environmental Management Policy for the Durban Metropolitan Area; and legislation, such as NEMA; as well as international literature and local knowledge. The principles which were presented in each of these sources were then carefully considered, and from these, 20 principles which were deemed to be the most fundamental were selected. These were principles that were considered to be vital in ensuring the efficient management of the Clansthal conservancy, and through this, long term sustainability. These 20 sustainability principles are presented in Figure 5.2. They are principles which are linked

to the four dimensions of sustainability, and will therefore allow a holistic view of the environmental state which the conservancy should strive towards.

Table 5.1: Sustainability principles key to the management of the Clansthal conservancy

Key Sustainability Principles	
1. Sustainability	11. Existence of monitoring and evaluation procedures
2. Conservation of biodiversity and maintenance of ecological integrity	12. Justice
3. Holism	13. All interests, values and needs must be taken into account when decisions are made
4. Sensitive, vulnerable, highly dynamic or stressed ecosystems require specific attention	14. Pursuit of the best practicable option
5. Public participation and access	15. Make best use of local efforts and resources, and attempt to reach solutions at the local level
6. Continual improvement	16. Sustainability education, promoting shared values amongst the community
7. Shared responsibility	17. Common heritage
8. Use of local skills and talents	18. Partnerships between government, community and the private sector
9. Precaution	19. Commitment to training and capacity building of the local community
10. Accountability for actions	20. Resilience

These are the principles which were deemed to be the most influential and vital for the area when considering the characteristics of Clansthal as an urban system, with a unique natural environment as well as a unique sense of place. It is an area which is being ‘threatened’ by increasing development pressure; and has a conservancy which is committed to the conservation of the environment and has a desire to create an integrated

community. The indicators which were developed for the area will allow the determination of whether these principles are being attained, and therefore whether the conservancy is achieving the goal of local long term sustainability.

5.2. Key issues identified in Clansthal

In order for sustainability indicators to be developed for an area, the key challenges or issues in the area need to be identified, which will then become the criteria for which the indicators are developed. Issues were thus identified by the various stakeholders of the Clansthal conservancy, through the questionnaires administered by the members of the research team. The key issues in the conservancy area were also identified from literature and secondary reports, such as the eThekweni Catchment Management Plan, which provided information on the aMahlongwana and aMahlongwa catchments. Some of the issues were decided upon from personal observation and from discussions with the conservancy committee members.

All of the residents who were spoken to were aware of the existence of the Clansthal conservancy, and had varying degrees of knowledge concerning the purpose and functioning of it. The conservancy committee members, and those residents who attended conservancy meetings or had a family member who was involved in the conservancy, appeared to be the most knowledgeable about the importance of the area's environment, as well as the key challenges facing Clansthal. This highlighted the influence that the conservancy has already had within the community.

The issues which were raised pertained to the four dimensions of sustainability. However, a number of them were problematic to categorize, as they are related to more than one dimension, illustrating the interconnectedness of the dimensions of sustainability. Analysis of these issues and how they may be measured and monitored thus became a complex task which required much deliberation. The next step was therefore to categorize the issues into the four dimensions of sustainability, in order to gain a better understanding of the environmental concerns in Clansthal. Figure 5.3 shows the identified issues categorized into the four dimensions of ecological, social, economic and governance.

Table 5.2: The identified ecological, social, economic and governance issues

Ecological	Social	Economic	Governance
Alien vegetation	Crime/ security	Development pressure	Responsibilities of local government
Overfishing	Participation	Unemployment	Relationships
Poor condition of wetlands	Attitudes of locals, authorities and developers	Local employment opportunities	Partnerships
Soil erosion and degradation	Education	Economic spin-offs of conservancy initiatives	Compatibility with other initiatives
River quality	Awareness raising	Tourism	Planning
Pollution	Aesthetical and spiritual value of environment	Economic cost of wave/ storm damage	Management of coastal zone
Maintenance of biodiversity	Quality of life		Land distribution
Ecological storm/ wave damage			
Rehabilitation			

5.2.1. Key ecological issues

a) Pollution

This issue was raised by a number of people, particularly in the form of litter. Litter and pollution in general, pose a threat to the sustainability of an area, as they may cause interference with the functioning of particular systems. One of the main concerns regarding litter was that of the litter left by fishermen, which apart from reducing the aesthetic value of the beach, posed a threat to the marine life. One example of this was given by a conservancy member, who stated that there are cases where turtles swallow the clear packets which the fishermen throw into the sea, as they confuse them with jellyfish which are one of their sources of food (Shaun Chester, 20/08/07). Fishing hooks

left in the fish on the beach also pose a threat to dogs which may attempt to eat the fish, and therefore swallow the hooks (Quinn Mann, 19/08/07). The pollution left on the beach, therefore decreases the area's aesthetic value, but more importantly, poses a danger to the area's marine and other animals.

b) Alien vegetation

This was an issue raised by all of the members of the conservancy, as well as 67 percent of residents. Many of the respondents were aware of the presence of alien vegetation in Clansthal, and the focus of the issue was on the removal of this vegetation, and the introduction of more indigenous vegetation. Invasive alien species can be described as species that occur outside of their natural habitat or country of origin, and establish themselves in these non-native habitats as they are able to outperform and outgrow indigenous species. This results in the replacement of natural vegetation with dense infestations of alien species which have a negative impact on water resources, through affecting water quantity and quality; and disrupting the functioning of natural ecosystems, leading to loss of agricultural potential and biodiversity (Agriculture and Environmental Affairs, 2005).

The conservancy members were thus highly concerned about the removal of alien species, and had been taking action through an alien removal project, which was limited by funding from the national Working for Water Programme. A number of residents had also become concerned and had begun to remove the alien species from their gardens, and introduce more indigenous species (Resident 1, 19/08/07). Figure 5.4 shows the number of conservancy members and residents who felt that alien vegetation was an issue in Clansthal.

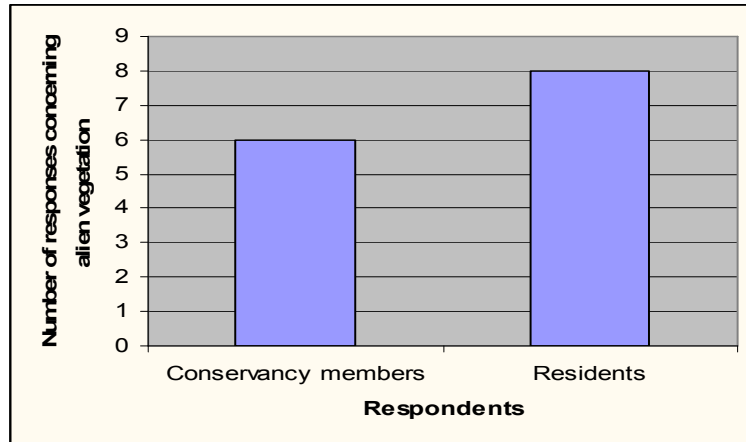


Figure 5.2: Number of respondents concerned about alien vegetation in Clansthal

c) Overfishing

Fifty percent of the conservancy members, as well as a few of the residents in the area were concerned about the amount of fishing occurring in Clansthal. One of the conservancy members referred to it as the “murder of wildlife” and the “abuse of the Clansthal coastline”, and observed the presence of 62 fishermen on the beach on one particular day (John Forest, 19/08/07). The conservancy committee is of the opinion that Aliwal Shoal should become a no take fishing zone, allowing for fish species to establish themselves there, and move out into other areas. They are currently planning attempts to have the Marine Protected Area of Aliwal Shoal extended landward, as this would allow for more effective management with a more holistic view of the whole area. The concern about this issue was evident when one of the respondents stated that we should “protect the shoal and marine life” (Resident 9, 20/08/07).

The issue of overfishing was reiterated through personal observation, as shown by the following photograph taken on the 20 of August, 2007; which shows the fishermen fishing off Greenpoint on one day. These were not the only fishermen on the beach, this merely represents a portion of the total fishermen present on the particular day.



Plate 5.1: Fishermen on Greenpoint on one particular day (20/08/07)

Overfishing is a key concern when attempting to attain sustainability, as the depletion of fish stocks affects the marine ecosystems. Fish are caught in large quantities and may not be able to recover if too many are taken, which results in low fish stocks in certain areas, with effects spreading to the entire ecosystem. Sustainability cannot be attained when a natural resource is exploited in such a way.

d) Wave/storm damage

A number of residents in the Clansthal area, as well as members of the conservancy committee raised the issue of wave/storm damage as a key challenge in the area. This was largely due to the fact that a large amount of damage had been caused to the beachfront properties by the March storm and subsequent changes in wave patterns. The cost of repairing the damage and putting in place preventative measures to avoid further damage is several hundred thousand rand for each property (Resident 5, 20/08/07), and the damage to the environment cannot be accurately measured (Rob Crankshaw, 19/08/07). The owners of these beach properties were therefore concerned about further damage to their houses, and a number of them were concerned about the dunes along the beach. One of the conservancy members noted that “the sand banks are gone” (Keith Cunningham, 19/08/07) and one of the residents stated that the recent storm and wave damage had “demolished the beach” (Resident 4, 20/08/07).

This issue was also reiterated through personal observation of the beach which highlighted the extent of the damage. The following are photographs which were taken on the 20 of August this year, 2007 along the beach in Clansthal, which illustrate the damage which was caused, as well as some of the restorative and preventative measures which have been implemented by the residents.



Plate 5.2: Damage to the dunes from the storms and subsequent waves



Plate 5.3: Damage to a beachfront properties, and the protective measures implemented



Plate 5.4: Preventative measures implemented for a beachfront property

e) Maintenance of biodiversity

This was another issue which was raised through the interview process, and many of the conservancy members, as well as the residents had strong views on the issue. One of the conservancy members stated that “we have done enough damage, we should try and preserve every bit of coastal dune from further destruction” (Angela Kightley, 19/08/07). The residents also voiced opinions on the issue, and one resident felt that one of the reasons that maintaining biodiversity was important was to “preserve the environment for our children” (Resident 1, 19/08/07). Another stated that “we have already gotten rid of so much, we must keep it and enhance it” (Resident 9, 20/08/07).

Penny Croucamp (03/09/07) reiterated the importance of biodiversity, particularly along the coast and in the estuaries, and stated that there is a great opportunity to enhance the biodiversity within Clanshal. The maintenance of biodiversity is vitally important for the health and sustainability of ecosystems, and should thus be a priority for all management strategies.

A number of other issues including rehabilitation, poor condition of wetlands, soil erosion and degradation, river quality, and climate change are key ecological issues which were mentioned by members of the conservancy during the initial discussions

with the research team, and are thought to be particularly important to the ecological integrity of a community, which in turn affects its sustainability.

5.2.2. Key social issues:

a) Crime /security

Crime was an issue raised by a number of people, mainly the residents. A number of residents were concerned about the level of security of the Clansthal area and mentioned that they would like to feel safer (Resident 4, 20/08/07; Resident 10, 25/08/07; Resident 7, 20/08/07). Crime is a social issue which poses a threat to the sustainability of an area, as it has impacts on the functioning of the social system of the community. It creates distrust and fear, erodes the identity of an area, and thus affects the interactions of the community. Crime also affects the level of investment which will occur in an area, as well as causing property values to decrease. It thus affects not only social interactions, but also has a negative effect on the economy of an area.

b) Attitudes of locals, authorities and developers

The attitude of the locals was a key challenge raised by members of the conservancy, who felt that the attitudes of the residents of Clansthal as well as the fishermen needed to be changed, and become more environmentally conscious. This was due to the observations that some residents were dumping refuse, others took no action when dumping occurred across from their properties, and that the fishermen tend to leave large amounts of rubbish on the beach at the end of each day (Keith Cunningham, 19/08/07). The members of the conservancy would like the attitudes of the local people towards the environment to change in order to allow for a more joint effort in the protection of the environment. One of the conservancy members stated that many of the residents have a “someone else will fix it attitude”, and that they would like to “change the way residents treat the environment” and ultimately have a “community of people who practise what they preach” (Keith Cunningham, 19/08/07).

The attitudes of authorities was also an issue, as it was felt they should have more involvement in the environmental management in Clansthal (Rob Crankshaw, 19/08/07), and should “start delivery” (Keith Cunningham, 19/08/07). Some conservancy members

also felt that many of the developers who propose developments in the area are focusing on a quick return and are only considering what will happen in the short term (Keith Cunningham, 19/08/07), rather than looking ahead to the medium and long term to determine what the best way forward for the area is if sustainability plays a key role. One conservancy member noted that they simply had “greed for profit” (John Forest, 19/08/07).

The attitudes of local people, the authorities and developers are key in ensuring the effective management of the environment. If the local people and authorities adopt a ‘don’t care’ attitude to the environment, management is made more difficult for those who have a more environmentally aware attitude, undermining the process. In areas where the attitudes of the local people and authorities are ‘more environmentally friendly’, sustainability becomes a realistic goal.

c) Participation, education and awareness raising

Other issues raised by the conservancy members were participation, education and awareness raising. The conservancy members stated that participation of the community members is necessary to ensure greater protection of the environment. Participation was considered key by 50 percent of the conservancy members (Shaun Chester, 20/08/07; Angela Kightley, 19/08/07; Quinn Mann, 19/08/07), and 50 percent of the residents were already involved in attending meetings of the conservancy.

Awareness raising was another issue raised, as 83 percent of residents had received information via e-mail or letters concerning the actions and ideas of the conservancy, or had been requested to be involved with the conservancy. This serves to increase awareness of the conservancy initiatives, as well as increasing local knowledge and appreciation of the environment. Figure 5.9 gives an indication of the number of residents who are participating in the conservancy initiatives or attending meetings; and the number of residents who have been requested to be involved, or have received information.

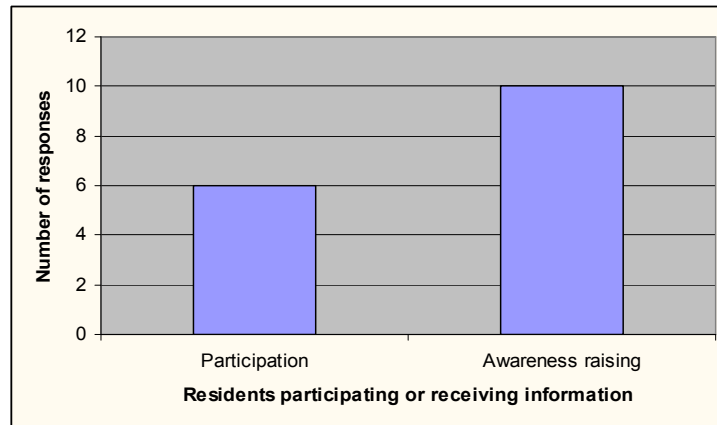


Figure 5.3: Number of residents who participate in, or are aware of, the conservancy

Education was another issue that was discussed by the conservancy members who felt this was key to achieving greater awareness of the environment (Rob Crankshaw, 19/08/07), and consequently increasing involvement of the community, and changing their attitude.

d) Aesthetic and spiritual value of environment (sense of place) , and quality of life
 These issues were identified though the questionnaires, as well as through personal observation. When asked to list three things that they like about the Clansthal area, 94 percent of the respondents mentioned these issues in the form of stating that they liked Clansthal because it is peaceful (Resident 5, 20/08/07), undeveloped (Resident 8, 20/08/07), has a village atmosphere (Resident 12, 25/08/07), and some referred to the ambience of Clansthal (John Forest, 19/08/07). One of the respondents referred to Clansthal as “paradise” and stated that they “would like the area to remain undiscovered” (Angela Kightley, 19/08/07).

These issues are important when examining sustainability as they reflect the social dimension of an area. They are determinants of satisfaction levels of the people in an area, as well as affecting the functioning of, and relationships within a community. Figure 5.10 below depicts all of the aspects of Clansthal which were liked the most by the respondents, and how many people stated each aspect.

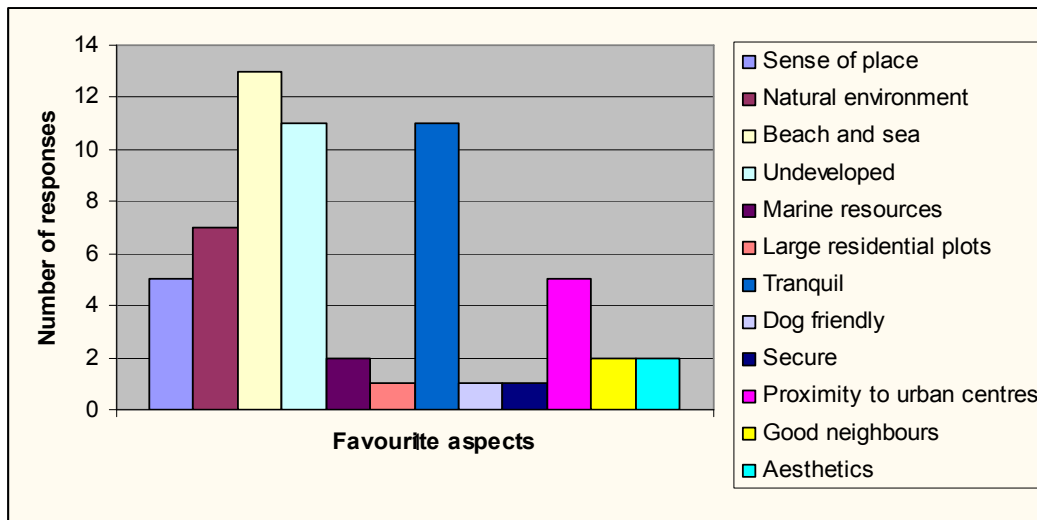


Figure 5.4: Number of responses for each of the favourite aspects of Clansthal

5.2.3. Key economic issues:

a) Development pressure

One of the major issues raised, was that of overdevelopment. All of the conservancy members and 75 percent of the Clansthal residents were concerned about the type and size of development which may occur in Clansthal. The concerns were related to the capacity of Clansthal to handle large developments, as well as the knock on effects which such developments would have. Many responses involved the infrastructural capacity (Resident 6, 20/08/07; Resident 12, 25/08/07) of a small village like Clansthal to accommodate developments which may double or even triple the population (Keith Cunningha, 19/08/07).

The knock on effects, such as increased traffic (Shaun Chester, 20/08/07), increased run off from increased hard surfaces, overcrowded beaches (Angela Kightley, 19/08/07) and the development of shopping centres (Quinn Mann, 19/08/07), were also mentioned as a concern, as this would result in further destruction of the natural environment, as well as changing the identity and sense of place of Clansthal. Many of the conservancy committee members and residents accept that development will occur, or would like to see some development in the area; but the majority of them feel that this should be limited to that which is suitable to the area and which the area can effectively accommodate. One of the respondents stated that development should occur “in harmony

with the environment” (John Forest, 19/08/07), and another stated that there is “so much that could be ruined by too many people” (Angela Kightley, 19/08/07).

It was not only the conservancy committee members who voiced strong opinions on the issue of overdevelopment; one resident commented that they “don’t want to live in a concrete jungle” (Resident 5, 20/08/07), and another stated that they have no problem with some development “but it should not be at the cost of the area or the residents” (Resident 2, 20/08/07). Figure 5.11 gives an idea of the number of respondents who were concerned about development, and what particular aspects of development concerned them the most.

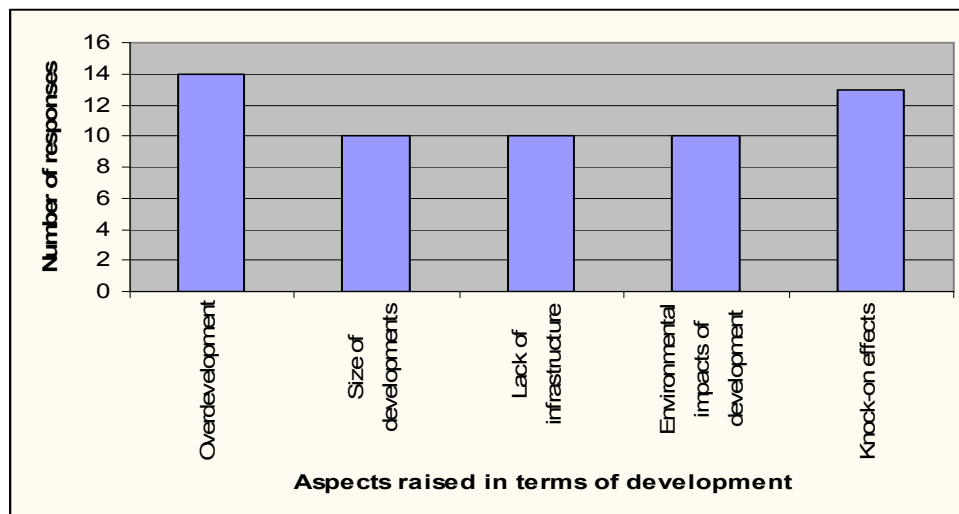


Figure 5.5: Number of respondents concerned about future development in Clansthal

Development plays a major role in sustainability as it equates to economic growth. As previously mentioned, in a developing country such as South Africa, economic growth is essential in order for society to progress. However, this development should not occur at the expense of the ecological or social sustainability of an area. Many of the issues, including that of development pressure highlight that this proves to be one of the key challenges in the Clansthal area: balancing the economic, ecological, social and governance dimensions of sustainability. This is therefore a challenge which requires attention and must be addressed as a priority in any management measures which are implemented in the area.

- b) Unemployment, local employment opportunities, economic spin-offs of conservancy initiatives

These issues were identified as key to the area of Clansthal as the conservancy members were concerned about the unemployment of the local people. They have created local employment opportunities through a number of their initiatives, including their alien clearing project as well as through employing car guards for the beach parking area (Conservancy meeting, 10/03/07). They also wish to create further local employment opportunities through further conservancy initiatives, including the training of local people as guides for nature trails which they hope to introduce in the future (Conservancy meeting, 10/03/07).

Unemployment is a key concern for all communities, as it has a negative impact on the social and economic sustainability of an area. Local employment opportunities and economic spin-offs which may arise from conservancy initiatives are therefore highly valuable and vital to ensuring the sustainability of the Clansthal area.

5.2.4. Key governance issues:

- a) Responsibilities of local government

The responsibilities of local government was an issue which was raised by all of the conservancy members who were interviewed, as well as 75 percent of the residents. The concern focused on the role of the local government in Clansthal in terms of managing the environment, addressing the issues in Clansthal; as well as in terms of general maintenance in the area, such as the provision of streetlights. One respondent stated that the “municipality should be” monitoring the issues in the area (Keith Cunningham, 19/08/07), and another stated that “we pay rates and taxes and nothing is done” (Resident 4, 20/08/07). Figure 5.12 shows the responsibilities which the 18 respondents felt were necessary for local government in Clansthal, and the number of respondents who stated each one.

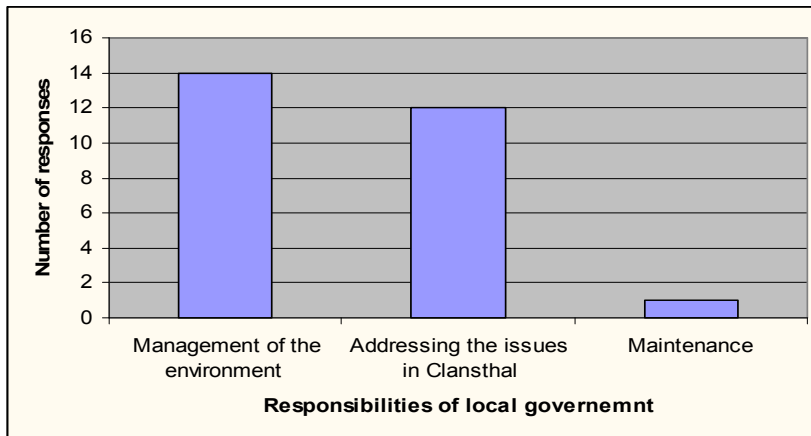


Figure 5.6: Respondents views of the required responsibilities of local government in Clansthal

In order for sustainability to be achieved in any community, involvement from all stakeholders is a necessary requirement in the management and maintenance of the environment. This goal cannot be achieved if all stakeholders do not fulfill their responsibilities, and if cooperation is not possible.

b) Partnerships

When asked who should be responsible for the management of the environment in Clansthal, and who should be addressing the challenges in the area, all of the conservancy members and 75 percent of the residents answered that it should be managed by some form of partnership between the community, the conservancy and the municipality. It was felt that all stakeholders should play a role in the management of the environment as this is the best way to ensure that the best practicable option is implemented.

Figure 5.13 shows the number of respondents who felt that the various entities should be responsible for the management of the environment in Clansthal, through some form of partnership between the Clansthal conservancy, the eThekweni municipality, the community of Clansthal, Ezemvelo KZN Wildlife and the Crookes Brothers who own a portion of the land in Clansthal.

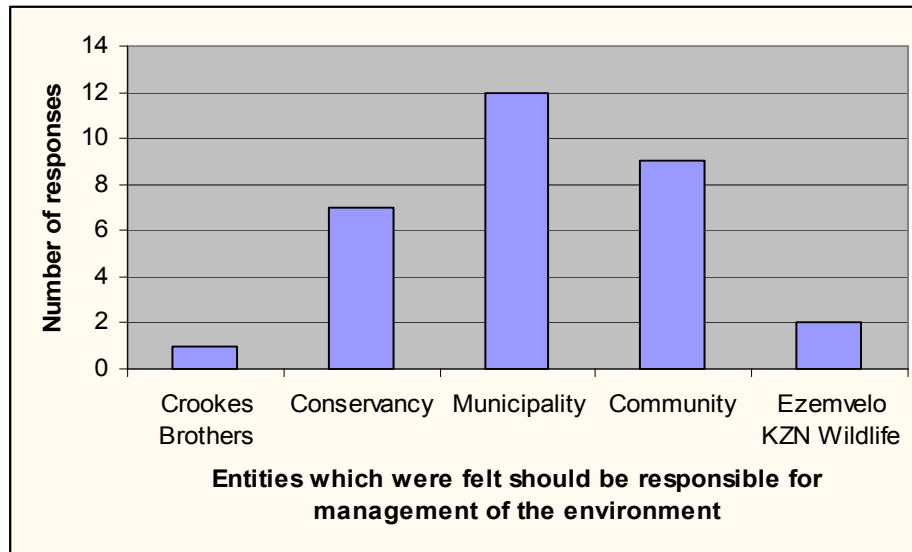


Figure 5.7: Entities felt to have a responsibility for managing the environment

c) Management of the coastal zone

This issue was identified through the interviews, and was primarily concerned with the effects of the March 2007 storms and the subsequent wave damage. The conservancy committee members all stated that the storm and waves had caused a large amount of damage to the coastline itself as well as the properties situated there. Rob Crankshaw (19/08/07) stated that “the coastline is 20 metres inland to where it was”, and Angela Kightley (19/08/07) observed that the impacts of the storms and waves on Clansthal were “devastating”. The majority of residents, 75 percent, also stated that they were concerned about the shifting edge of the coastline. This issue of coastal zone management was reiterated in the interview with the coastal engineer, Andrew Mather, as being a key concern for coastal areas. He explained that the recent extreme conditions of March and June 2007 “scoured the whole coast of sand” and when this “sand goes out so far it doesn’t return”, creating “a much steeper beach” (Andrew Mather, 03/09/07). He also stated that similar extreme wave conditions to those which were experienced “can be expected approximately every 10 to 12 years” (Andrew Mather, 03/09/07). This highlights the need for coastal zone management, particularly in the face of such threats.

Coastal zone management is key to sustainability as storms and waves such as those witnessed this year, are responsible for extensive coastal damage, which not only compromises the functioning of the coastal ecosystems and results in immense financial

costs, but also has negative effects on the tourism in the area, which translates into further economic losses. This combination of effects ultimately presents a major challenge to the sustainability of an area.

5.3. Indicator development

The sustainability indicators which were developed serve the purpose of aiding in the monitoring and management of the Clansthal conservancy. They achieve this through their measurement of particular ecological, social, economic and governance issues. Following the identification of the key issues in the Clansthal area, the issues became the criteria for which indicators and measures were developed. Through the measurement of these criteria, it can be determined whether the environment is being managed in such a way that positive change is occurring, or whether management is not as effective as it should be. The indicators will also provide early warning of any problems which may be occurring in the ecological, social, economic or governance environments of the conservancy. This essentially allows the measurement, assessment and reporting of progress in terms of meeting the goals of sustainable development and sustainability principles (Ghosh *et al*, 2006).

The indicators will also aid in the enhancement of the understanding of relevant social and environmental problems, the facilitation of capacity building for communities, and may assist in guiding development projects and policy (Reed *et al*, 2006). This will allow the conservancy to play a more active role in the area, with input from a more informed community.

Many of the indicators which were chosen are those which can be easily understood by the community. This is due to the fact that the conservancy committee consists mainly of members of the community, and will also allow the rest of the community to understand them and provide input for the management of the area. The indicators are therefore more locally derived indicators, rather than indicators which are based on technical and scientific knowledge. Some of the indicators, however, are of a more scientific nature which will allow for further investigation of the criteria. This was considered to be appropriate for the conservancy as they do have a number of specialists on the

committee, who have a greater level of scientific knowledge. These include John Forest, who is a conservationist and Quinn Mann, who is a retired agricultural extension officer (John Forest, 19/ 08/07; Quinn Mann, 19/08/07).

Each of the issues which were identified through the questionnaires or from the literature formed the criteria for which the indicators were developed. Each of these criteria is best measured and monitored by a number of indicators, rather than simply one. For any criteria, there is no one perfect indicator which is able to measure the criteria and provide the answer as to what is occurring. A number of indicators are therefore needed to provide a clear understanding of the state of the environment, as well as any changes which may be occurring. Therefore, when measuring a certain criteria, the best outcome will be achieved through the utilization of a combination of indicators.

For the development of sustainability indicators, it was considered appropriate to adopt the approach used in the National set of indicators for forestry in South Africa, whereby the indicators which were developed consisted of a variable and an associated measure or measures. Each variable is therefore a statement of what is to be measured in order to determine the state of the environment and changes occurring within, and the associated measures are the specific ways in which the variable is to be measured.

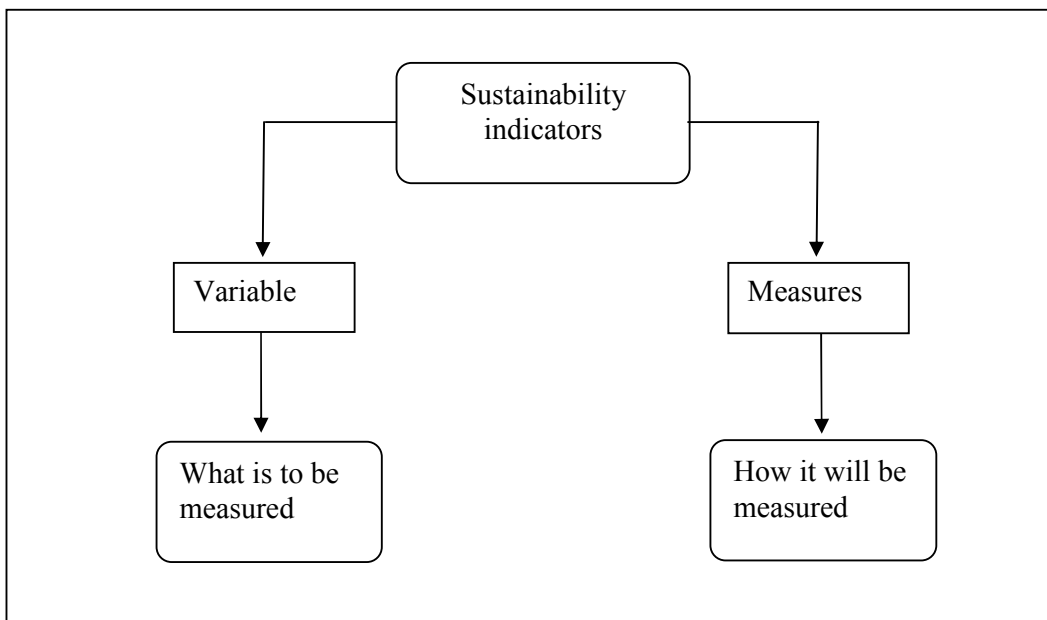


Figure 5.12: The constituents of the sustainability indicators

The chosen sustainability indicators allow a broad view of the ecological, social, economic and governance systems within the Clansthal conservancy, while taking key aspects into account and focusing on certain issues at a greater level of detail. This is achieved through the development of a few indicators which have the ability to be used to measure a number of parameters, thus making them highly effective for environmental management.

Although the indicators which have been developed are categorised into ecological, social, economic and governance, and are provided specifically for certain criteria, they may be used to measure more than one criteria and may be used to measure across the four dimensions of sustainability. This allows complex systems to be understood in simplified terms, through a rapid assessment of a number of the key issues in an area through the use of just a few indicators and their measures. The following tables presented in Figure 5.14, 5.15, 5.16 and 5.17 contain the ecological, social, economic and governance issues which were identified for the Clansthal area and became the criteria, as well as the associated variables and measures which were developed.

5.4. Sustainability Indicators

5.4.1. Ecological indicators

Table 5.3: The ecological criteria, variables and measures for the Clansthal conservancy

<u>Criteria</u>	<u>Variable</u>	<u>Measure</u>
Alien vegetation	Alien cover	Percentage of alien plant species cover in particular areas
		Known alien species present in the area: Number and a list
		List of the most threatening alien species in the area
	Alien clearing/ removal	Number of people involved in clearing of alien vegetation
		Number of residents involved physically or financially in the clearing of alien vegetation

		Rate of clearing of alien vegetation- m ² per month
		Amount being spent on the clearing of alien species per month/ year
		Number of residents introducing indigenous species into their gardens
		Photographs over time to illustrate progress of alien removal
	Protection of indigenous vegetation	Conservation value of indigenous vegetation communities (linked to environmental services value)
		Indigenous vegetation protected as a percentage of total land cover
Overfishing	Scale of fishing in Clansthal	Average number of fishermen per week/ month
		Photographs over time illustrating the number of fishermen on the beach
		Percentage of fishermen without permits
		Catch per week/ month
	Endangered/ threatened species	Number of endangered/ threatened fish species in the Clansthal area
	Impacts of resource use	List of the impacts of resource use on biotypes/ community structure
Poor condition of wetlands	Wetlands area	Total present area of wetlands. Ha
	Condition of wetlands	Photographs of the wetlands over time
		Area of healthy/ functioning wetlands
	Services currently provided by wetlands	List of services currently provided by wetlands in Clansthal per year
	Loss of size and function of wetlands	A list of the individual pressures such as pollutant loads and overexploitation
		Permitted wetland alteration. Ha
Soil erosion and degradation	Activities occurring in catchments	Agricultural practice in catchments: presence of soil conservation controls

		Percentage of area in catchments under construction	
Quality and extent of vegetation cover in catchment		Percentage cover of alien vegetation, forestry or annual harvest crops, e.g: sugarcane	
		Percentage area of vegetation disturbance by human activities	
Silting/ closure of estuary		Frequency of closure/ siltation of estuary due to soil erosion	
Top soil loss		Amount of top soil lost per year	
		Erosivity of soil types: sensitivity index	
		Frequency of sheet erosion	
		Average slope of the landscape	
Soil loss due to rainfall		Average amount of soil loss during rainfall events	
Evidence of erosion		Number of erosion dongas and gullies	
		Number of incidents of slumps, landslips and landslides	
Water quality	Baseline	Record of the baseline water quality characteristics	
	pH	pH levels of the river once a year	
	Turbidity	Turbidity of the river once a year	
	Hardness	Hardness of the river once a year (does the water lather)	
	Salinity	Salinity of the river once a year	
	Eutrophication		Frequency of algal bloom occurrence
			Nutrient levels
	State of estuaries		Photographs of the estuary mouth over time
			Record of freshwater inflow
	Risk to water quality		Decrease in number of incidents of spills from transport infrastructure and pipelines
		Frequency of closure of estuary-concentrating pollutants	

	Evidence of poor water quality	Rate of fish kill incidents
		Number of recorded incidences of water borne disease, e.g: cholera
		Number of days per year when estuary and rivers could not be used for recreation
	Pollutants	List of the pollutant types, change per year
		Average amount of pollutant inputs per year
		Number of sightings of floating objects and surface contaminants
		Record of location of areas with bad odours
		Trace metal concentration in sediments
	Presence of wildlife	Number of clawless otter sighted
Pollution	Sources and type of pollution	List of pollutants
		List of pollutant origins
		Quantity and category of litter per Ha
		Photographs of key litter spots over time
		Type and quantity of plastic pollution per kilometre of coastline
	Presence of insects	Number of fireflies sighted
	Pollution incidents	Number of pollution incidents along coast per annum
Maintenance of biodiversity	Species	Number of endemic species
		Population trends of vulnerable and endangered species
		Percentage cover of protected species
	Ecosystems	Area of sensitive, vulnerable and highly dynamic ecosystems
	Presence of wildlife	Number of leopard sighted
		Number of sightings, and diversity of marine mammals

		Number of sightings, and diversity of seabirds
	Land use changes	Percentage of total land which has changed use in last 5 years
		Percentage of total land that is earmarked for future change
	Threat to biodiversity	Rare, endangered, protected and/ or threatened species as a percentage of known species
		Area of priority habitats lost each year, as a proportion
		Percentage area invaded by alien species or disturbed by illegal dumping
		Level of demand for economic growth, and associated pressures on land for commercial and infrastructural development
		Percentage decrease in species number due to anthropogenic influences
	Coastal Habitats	Extent and distribution of coastal habitats (fore dunes, sandy beach, rocky beach)
		Key coastal habitats as a percentage of total land area
		Species inventory of coastal habitats
		Record of seabird populations
		Number of cetaceans
		List and number of species in and adjacent to estuary
		Proportion of each coastal habitat under low/ medium/ high use
Storm/ wave damage	Extent	Percentage of area of dune or other coastal habitat disturbed or lost
	Threat of damage	Expected frequency of occurrence of extreme weather
		Predicted sea level rise per year/ long term (in mm)
		Rate of increase of hard surfaces

		Percentage cover of natural vegetation on dunes
		Average slope of beach
	Preventative measures	Number of residents taking preventative measures
		Percentage of soft and hard preventative measures/ structures put in place
	Shoreline stabilization	Percentage of coastline subject to erosion processes
		Annual rate of erosion
		Length of coastline (1) Regressing (2) Stable (3) Advancing
		Change in slope of beach
		List of measures introduced to prevent or minimise erosion of shoreline
		Photographs of coastline over time (demonstrate erosion)
Rehabilitation	Evidence of rehabilitation	Percentage of total land which has been rehabilitated, or is earmarked for rehabilitation
		Area of wetlands rehabilitated or earmarked for rehabilitation. Ha

The ecological indicators which were developed were drawn from a number of sources, including literature, reports, local knowledge, personal ideas and discussions with other individuals. Some of the variables and their associated measures such as shoreline stabilization; the percentage of coastline subject to erosion processes; rare, endangered, protected and/ or threatened species as percentage of known species; and key coastal habitats as a percentage of total land area were drawn from a reference guide on the use of indicators for integrated coastal management (Belfiore *et al*, 2003).

Others, such as population trends of vulnerable and endangered species, list and number of species in and adjacent to estuary, and number of pollution incidents along coast per

annum were drawn from reports on the monitoring and reporting on the state of the coast in South Africa (CSIR, 2004; CSIR, 2005).

Some of the variables and their associated measures have emerged from local knowledge of the Clansthal conservancy committee members, such as the species inventory of coastal habitats, the presence of wildlife, and the number of leopards, fireflies and clawless otters sighted. The species inventory will give an indication of the biodiversity which is present in Clansthal. The sightings of the clawless otter and fireflies provides an indication of the state of the environment, as they are both very sensitive to pollution, water and air pollution respectively (Keith Cunningham, 19/08/07; John Forest, 19/08/07); and therefore provide an indication of the level of pollution in the area. The sighting of leopards is an indication of biodiversity, as the presence of leopards indicates the presence of prey (John Forest, 19/08/07).

A number of indicators were also personal ideas, such as the preventative measures which are being put in place, the number of residents involved physically or financially in the clearing of alien vegetation, the area of wetlands rehabilitated or earmarked for rehabilitation, and the pH of the river. The ideas for some of the indicators were also drawn from literature, such as land use changes and pollutants; as well as through discussion with other individuals, such as photographs of key litter spots over time.

Further variables and measures were drawn from the 2002 report on eThekweni catchments (Diedrichs *et al*, 2002), such as percentage area invaded by alien species or disturbed by illegal dumping, frequency of closure of estuary- concentrating pollutants and length of coastline (1) Regressing (2) Stable (3) Advancing.

A number of the measures of the various indicators which were developed, were stated in such a way that the conservancy, in the use of the indicators and measures, may choose the best way to utilise the measures depending on what is suitable and appropriate for their specific circumstances in terms of timeframes. These measures include the amount being spent on the clearing of alien species per month/ year and the average number of fishermen per week/ month, which allows the conservancy to choose the timeframe within which they prefer to work.

5.4.2. Social indicators

Table 5.4: The social criteria, variables and measures for the Clansthal conservancy

<u>Criteria</u>	<u>Variable</u>	<u>Measure</u>
Crime/ security	Frequency of crime	Number of crime related incidents per month
	Resolution of crime	Number of perpetrators caught as a percentage of the total suspected number
	Security	Number and list of security measures in place
	Role of conservancy	Number and list of security initiatives of conservancy
		Amount spent on security measures per month/ year
Participation	Involvement	Number of new members of the conservancy since its inception
		Number of businesses involved in the conservancy
		Number of sponsors
	Mechanisms for public participation and extent of use	Number of conservancy initiatives
		Number of residents involved in conservancy initiatives
		Number of conservancy meetings per month/ year
		Average number of people attending meetings
		Existence of Conservancy website
		Number of visits to conservancy website per month (web hits)
		Number of comments made on website per month
Attitudes, priorities and perceptions	Behaviour	Number of incidents which reflect a change in behaviour of Clansthal residents
		Number of residents becoming more environmentally aware

	Feedback	Percentage of positive feedback received by conservancy versus percentage of negative feedback
		Number of residents willing to participate in conservancy initiatives per month/ year
Education	Education initiatives	Expenditure of conservancy per annum on education material/ seminars/displays
		Number of new initiatives developed to educate/ inform residents and local people per annum
	Feedback reflecting education	Percentage of input from people that shows educated opinions/ changed views
Awareness raising	Correspondence/ information	Number of residents receiving letters/ e-mails concerning the conservancy and its initiatives
		Review of the content of letters/ e-mails
	Increased involvement	Number of incidents reflecting an increase in the level of community awareness: more members of conservancy, more involvement of residents
Aesthetical and spiritual value of environment	Appreciation/ Satisfaction	Number of people who undertake activities in the natural environment in the area, such as walking, surfing, bird watching
		Ratio of complaints versus satisfaction regarding 'sense of place' received by conservancy
	Related conservancy initiatives	Number of initiatives involving improvement of the aesthetical and spiritual environment in Clansthal per year
Quality of life	Community feeling/ spirit	Frequency of interactions with neighbours
		List of the type of interactions with neighbours
	Recreation opportunities	Number of recreation opportunities in the area
		List of recreation opportunities

The social indicators consisting of variables and their associated measures were also drawn from a number of different sources. Literature provided the variables and associated measures, such as the mechanisms for public participation and extent of use, the number of visits to conservancy website per month, and expenditure of conservancy per annum on education material/ seminars/displays.

Other variables and measures emerged from personal ideas, such as number of conservancy initiatives, number of new initiatives developed to educate/ inform residents and local people per annum and related conservancy initiatives.

Further ideas for indicators emerged from the questionnaires which were compiled by the research team, and the responses received, such as frequency of interactions with neighbours, number of recreation opportunities in the area, and number of people who undertake activities in the natural environment in the area, such as walking, surfing, bird watching.

The development of the social measures also involves measures which allow the conservancy to decide on the most appropriate timeframe for their purposes, which include the amount spent on security measures per month/ year.

5.4.3. Economic indicators

Table 5.5: The economic criteria, variables and measures for the Clansthal conservancy

<u>Criteria</u>	<u>Variable</u>	<u>Measure</u>
Development pressure	Increase in structural development in the coastal zone	Real (ha) or percentage increase in structural hard surfaces per year
	Trends in human pressure on marine and coastal zone	Nature, distribution and extent of human settlements in coastal area
		Percentage of new developments of individual properties versus percentage of large developments
	Future development	Number of proposed developments for Clansthal
		Number of new developments approved for Clansthal

Unemployment	Level of unemployment	Number of unemployed local people
		Number of cyclically unemployed local people
		Number of homeless people in the area
Local employment opportunities	Employment in conservancy initiatives	Percentage of labour force involved in conservancy initiatives which are employed from the local area
		Number of previously disadvantaged people employed
	Residential employment	Number of domestic workers in Clansthal
	Holiday employment	Number of local people employed at B&B's/ lodges during holiday seasons
Economic spin-offs of conservancy initiatives	Evidence of spin-offs	Percentage increase in tourism related ventures/ tourists in Clansthal as a result of conservancy initiatives
		Percentage increase in number of employment opportunities as a result of the conservancy initiatives
		Amount of investment in 'green areas' as a result of conservancy initiatives per year
Tourism and coastal development	Scale of tourism and coastal development in Clansthal	Number of B&B's/ lodges in Clansthal
		Number of tourists per km of coastline in holiday season
		Number of holiday properties in Clansthal
		Number of people using land and water based recreational activities in holiday season
		Number of access paths / roads onto beach per kilometre of coastline
	Importance of tourism	Value of tourism and employment in tourism sector (R/year)
		Amount from tourism benefiting low income groups per year
	Contribution of coastal resources	Contribution of coastal resources to the provincial and national economy (Amount/ percentage per year)

Economic well-being	Income	Income of each household per month/year
	Properties	Number of residents who own properties in Clansthal versus the number who rent properties
		Average size of properties
		Average amount spent on alterations/restoration of properties per year
Wave damage	Cost of damage	Average cost of damage per property caused by storm and wave events
		Cost of replacement infrastructure required after storm and wave events

The development of the economic indicators was also aided by a number of sources. Variables and their measures were drawn from a reference guide on the use of indicators for integrated coastal management, such as the increase in structural development in the coastal zone, trends in human pressure in the marine and coastal zone and the number of tourists per kilometre of coastline in holiday season (Belfiore *et al*, 2003).

Variables and their measures were also drawn from reports on the state of the South African coast, such as the number of access paths/roads onto beach per kilometre of coastline, income and contribution of coastal resources to the provincial and national economy (Amount/percentage per year) (CSIR, 2004; CSIR, 2005).

A number of the variables and measures also emerged from personal ideas, such as the cost of wave damage, the percentage of labour force involved in conservancy initiatives which are employed from the local area and future development. Ideas were also formulated from the questionnaires which were compiled and the responses received, such as the income earned of each household per month/year, and the number of residents who own properties in Clansthal versus the number of residents who rent properties.

Further variables and measures were developed from discussion with other individuals, such as the number of domestic workers in Clansthal and percentage of new

developments of individual properties versus percentage of large developments. The local knowledge of the Clansthal conservancy committee members also provided information for the development of economic indicators, such as the number of unemployed local people, which was considered a cause for concern (Conservancy meeting, 10/03/07).

5.4.4. Governance indicators

Table 5.6: The governance criteria, variables and measures for the Clansthal conservancy

<u>Criteria</u>	<u>Indicator/ variable</u>	<u>Measure</u>	
Responsibilities of local government	Priority	Number of incidents which reflect that priority is given to the environment in relation to other agendas in the area	
	Support	Number of incidents which reflect support being given to conservancy by local government	
	Financial expenditure		Amount spent by local authority on conservancy initiatives, such as clearing of alien vegetation, per year
			Amount spent on maintenance of infrastructure by government, per year
	Capacity		Number of people who are employed in local government, and are responsible for managing and monitoring the environment in Clansthal
			Number of people who are involved in strategic planning, and the amount spent on it, per year
			Number of decision support tools available
	Legislation and environmental protection		Number of legislative documents which are compatible with needs of coastal management plan/ environmental management plan
			Number of incidents which reflect that climate change policy is being implemented

	Ensuring enforceability and compliance	Number of incidents which reflect law enforcement along coastline
		Number of fines issued due to non-compliance with environmental regulations, per year
	Provision of information	Number of documents available concerning environment in Clansthal/ of south coast
		Number of documents providing information regarding future plans for the area (SDF)
	Management programmes	Number and nature of formally implemented estuarine management programmes
	Maintenance	State of facilities and infrastructure
		Number of days spent on the maintenance of infrastructure, per year
		Provision of streetlights
		Current expenditure on maintenance of facilities and infrastructure
	Relationships	Strength
Number of meetings between government and the conservancy		
Number of interactions between conservancy and residents		
Partnerships	Evidence of partnerships/ joint initiatives	Number of incidents reflecting change in support for the conservancy and its endeavours
		Number of suggestions implemented and complaints resolved which are raised by residents in conservancy meetings
		Number of joint initiatives in the conservancy: conservancy, local authority and community members

Compatibility with other initiatives	Evidence of compatibility	Number of conservancy initiatives linked to neighbouring conservancy initiatives
		Number of conservancy initiatives with are compatible with local government initiatives
Planning	Planning in line with IDP	Percentage of planning decisions that reflect that planning is in line with the IDP
		Type and extent of developments allowed in Clansthal
Management of coastal zone	Coastal zone extent and characteristics	Coastal zone extent
		Number of people within 100km of coast
		Coastal population density
		Rate of change of population growth in coastal area
		Percentage of natural versus altered land cover within 100km of coastline
		Area of land owned by public and public access areas
	Conservation	Percentage of coastline conserved
		List of conservation measures implemented
	Strategic planning of coastal development	Number of management and planning decisions which reflect consideration of strategic, long term and cumulative effects
		Number of decisions which reflect municipal commitment to coastal management
		Scope and role of coastal management plans
		Forums established for communication and decision making
		Number of developments allowed seaward of Development control line, per year

	Marine protected area	Area of MPA
		List of uses of the MPA
		Existence of management plan and authorised budget for MPA
		Number of pollution events recorded in MPA, per year
	Cost of maintenance	Amount spent on restorative and preventative measures following damage
	Initiatives addressing coastal zone management issues	Number of operational planning and management initiatives that effectively address coastal zone management issues (such as land use management and human activities within the coastal zone)
	Catchments	Nature and extent of catchment development
		Existence of catchment management programmes
Recreation	Number of marine recreation licenses issued per year	
	List of marine recreation permitted	
Management of coastal resource use conflicts	Number of incidents/ decisions which reflect e that coastal resource use conflicts are being addressed	
Land distribution	Land claims	Number of land claims in Clansthal
		Number of settled land claims in Clansthal

The governance variables and measures were also developed from a variety of sources, such as literature, reports, local knowledge, personal ideas and discussions with other individuals. Indicators and measures, such as the management of coastal resource use conflicts, coastal zone extent and characteristics and legislation and environmental protection were drawn from a reference guide on the use of indicators for integrated coastal management (Belfiore *et al*, 2003).

Coastal reports also contributed to the governance variables and measures, such as catchments, existence of management plan and authorised budget for MPA and number of fines issued due to non-compliance with environmental regulations per year (CSIR, 2004; CSIR, 2005).

Other variables and measures were drawn from other literature, such as capacity and evidence of compatibility. Personal ideas provided the nature and extent of developments allowed in Clansthal, support, and number of conservancy initiatives which are compatible with local government initiatives and number of joint initiatives in the conservancy: conservancy, local authority and community members.

Indicators and measures such as amount spent on restorative and preventative measures following damage and number of land claims (Quinn Mann, 19/08/07) in Clansthal emerged from discussions with other individuals and from the local knowledge of Clansthal conservancy committee members.

5.5. Collection, storing and reporting of data

Once the sustainability indicators have been developed, it is important to consider how the data which they will generate will be collected, stored and reported upon. The collection of the data is the first step in the implementation of the indicators. This may be carried out by the conservancy committee through the introduction of a group or committee which will be responsible for the collection of the data. This group should include members of the conservancy committee, as well as a number of community members who are willing to assist. The conservancy must decide how often they wish to collect the data and which data they feel is a priority to obtain. The conservancy may also consider forming partnerships with other stakeholders in order to collect the necessary data, and data may be collected by different functions within the eThekweni municipality.

The data must then be stored by the conservancy members. The data may be stored as hard copies or may be kept on the hard drive of a computer or saved on a disk. In order to ensure that the data is kept safe and is easily accessible, it is suggested that it is stored in at least two of these mediums.

In order for the implementation of the indicators to be a success, the data must then be reported upon. This could be achieved through incorporation into an EMP, or may be done through a sustainability report which is based on the information provided by the indicators. The conservancy committee must decide how to report upon the data and how often they would like to report upon it. The reports which are produced may be distributed to stakeholders of the Clansthal area, which may include the community members, neighbouring conservancies and the local municipality. The reports may also be posted on the conservancy website which is presently being developed.

It is vitally important that the data provided by the indicators is recorded over time, as this allows changes in the environment to be identified. It is critical to identify such changes, as this allows for a better understanding of what is occurring in the environment, as well as allowing the development of management strategies which incorporate these changes. It will also allow the conservancy committee or other stakeholders to determine whether any management strategies which they may implement are being effective or whether they are not having the desired effect within the environment and need to be reconsidered.

Some of the data which the indicators are able to measure is already being collected by the conservancy committee as well as by the local municipality in various ways. This will allow the conservancy committee to incorporate this information without having to collect it again.

The process of collecting, storing and reporting on the data provided by the sustainability indicators is complex and requires time. It is therefore not an easy or quick task. However, it is felt that the range of indicators which have been provided include a number of variables and measures which are somewhat more simple and for which data is easily available, thereby simplifying part of the process. It is also necessary to implement a process which requires careful implementation, in order to ensure the most effective monitoring and management strategies are introduced into the Clansthal conservancy.

5.6. The incorporation of sustainability indicators into an EMP

Sustainability indicators prove to be a highly valuable management tool, as they may be utilised for management on their own, and they may also be incorporated into other tools. One such management tool which may benefit from the inclusion of sustainability indicators is an EMP. The incorporation of the sustainability indicators which have been developed for the Clansthal conservancy into an EMP will now be discussed.

An EMP is defined as the action an organization is taking to ascertain how it affects the environment, comply with regulations, keep track of environmental management activities, and meet environmental goals and targets (EPA, 2005). Sustainability indicators therefore have the ability to form an integral part of an EMP as they are ideal tools for ascertaining what is occurring in the environment at a specific time, as well changes which occur in the environment. These changes may either be those which are occurring naturally in the environment, those occurring as the result of some external pressure or those occurring as a result of the direct actions of the conservancy.

Sustainability indicators will also allow for compliance with regulations, through the determination of how far from meeting compliance the conservancy is in terms of a particular aspect of the environment. This will allow relevant management strategies to be devised and implemented which ensure that the necessary changes are made in order for the regulations to be complied with. Sustainability indicators are also an ideal tool for the assessment of progress towards environmental goals and targets.

This project may be incorporated into an EMP in a number of ways, not only through the inclusion of sustainability indicators. The sustainability principles which were determined to be key to the management of the Clansthal area may be incorporated into the EMP as broad targets or goals which the conservancy wishes to achieve. Each of the principles may be accompanied by a number of sub goals which are more easily attainable over a specific period of time, and the time periods within which they wish to reach the goals may be established.

The key issues which were identified in the Clansthal area may also be incorporated into the EMP in order for the conservancy to identify which issues they need to address in order to ensure the sustainability of the area, as well as what they need to monitor. This could be incorporated as a list of the issues categorized as ecological, social, economic and governance issues. An indication of the most important issues which should be prioritized may also be given in order for the financial and human resources of the conservancy to be optimally utilized.

The sustainability indicators which were developed in this project will form a key component of an EMP, as they will allow the monitoring and measuring of the issues which were identified, and will allow determination of the progress towards the sustainability principles and goals in terms of the various issues.

It is evident that a large set of sustainability indicators has been developed, and it is likely that there will be data available for some, but not all of them. Due to these circumstances, the next step would be for the conservancy committee to work with other key stakeholders to determine which of the indicators are considered to be the most relevant and vital within the context of the conservancy. This will allow a smaller set of indicators to be chosen for implementation, therefore allowing a more concise determination of what is occurring in the ecological, social, economic and governance environments within the Clansthal conservancy.

In an EMP for the Clansthal conservancy, three sections would therefore be assimilated from this project. These would be:

1. Key sustainability principles for the management of the Clansthal conservancy
2. Key issues in the Clansthal conservancy
3. Sustainability indicators for the management of the Clansthal conservancy

The sustainability indicators which were developed will form a vital part of the EMP as they provide an effective, simple tool which will allow the measurement of a variety of aspects in the environment, allowing for efficient planning to take place as well as

ensuring that the most appropriate measures for management of the conservancy are implemented.

5.7. Summary

This section has presented the results of the study. Sustainability principles are vital to the management of an area such as a conservancy, and the key principles for the Clansthal conservancy have thus been identified from various literary and legislative sources. The key issues in Clansthal have been identified and discussed in terms of their importance to the community and the conservancy committee members, as well as in terms of their importance to the long term sustainability of Clansthal. The issues thus became criteria, and from these criteria, sustainability indicators and their associated measures were developed which will aid in the efficient monitoring and management of the Clansthal conservancy. These sustainability indicators have the potential to be incorporated into an EMP, which will allow the conservancy to efficiently and effectively manage their ecological, social, economic and governance environments.

Chapter 6

Conclusion

This study focused on the development of sustainability indicators for the Clansthal conservancy on the south coast of KwaZulu-Natal. The development of sustainability indicators is a complex process which needs to be considered in terms of the characteristics of the specific area for which they are being developed. Once developed, the merits and shortcomings of the indicators must be examined in order to determine their value for an area. The conclusions of the study are discussed in this section.

6.1. The study

The premise of the study was based on the ideas of sustainability and sustainable development, which have become terms used globally in environmental circles, as social and economic development have increasingly presented ‘competition’ for the ecological environment. Sustainability is the state where economic and social growth, and ecosystems can co-exist in the present and in the future.

There are many tools which have been utilised in order to measure sustainability or to ascertain what is needed for sustainability to be reached. One such tool is that of sustainability indicators. These are able to determine and monitor the state of the environment, as well as measure progress towards sustainability goals. They play a vital role in environmental management today, as they are tools which are able to be used extensively, and may be used alone or may be integrated into other management tools. Their importance is indisputable, and their implementation continues in a wide range of different areas and sectors across the globe.

The aim of the study was to develop a set of sustainability indicators for the Clansthal conservancy, and was achieved through the fulfilment of the stated objectives. The first objective to define a set of sustainability principles for Clansthal, was achieved as sustainability principles which were determined to be vital for the Clansthal conservancy were initially defined through the review of legislation and literature, and thereafter those were considered to be the most vital for the area were selected. The research which was

undertaken was qualitative, and a participatory approach was used to gather the necessary information for the study. The key issues in the Clansthal area were identified through the use of questionnaires administered to the various stakeholders, as well as through the review of literature and discussions with conservancy committee members, achieving the second objective.

The third objective was then achieved through the categorisation of the identified issues into ecological, social, economic and governance issues, and sustainability indicators and measures were developed for each of the key issues fulfilling the objective of developing sustainability indicators. This was based on the approach used in the National set of indicators for forestry in South Africa. The final objective was then met through the suggestion of how the indicators which were developed may be incorporated into an EMP.

6.2. Critical review of the indicator development

The development of sustainability indicators is somewhat subjective as there is no set process which must be followed. There are many sets of sustainability indicators which have been developed, but they do not all follow the same path, and each set incorporates different elements. The process of indicator development must therefore be determined by the researchers who are developing them, depending on the aspects that are felt to be the most important and require inclusion. The review of the work of others is also important as this allows a learning process to take place, by which sets of sustainability indicators are continually advanced and improved.

The model which was chosen to develop the sustainability indicators for the Clansthal conservancy can be concluded to be highly effective. This is due to the fact that it allows for the development of a number of indicators for specific issues using the data generated by key stakeholders, and further allows for the development of specific measures for each of the indicators. It therefore provides a number of measures for a specific indicator, ensuring that an indicator may be measured in more than one way, allowing it to be diverse and flexible. This allows for a comprehensive and holistic set of

sustainability indicators to be developed, which is the ideal outcome of such an endeavour.

Community involvement is vital to the development of sustainability indicators, as this allows for a thorough determination of the key issues in a specific area, as well as allowing local knowledge to be gained which may contribute greatly to the indicators and their associated measures. The people who live in the area are more knowledgeable about the area, and can provide insight into the ecological, social, economic and governance environment within which they exist. The interview process which was utilized in this study is considered to be an effective way of engaging stakeholders, as it allows for key questions to be posed to the respondents, as well as allowing further discussions to take place.

The use of the key issues in an area as the basis upon which sustainability indicators are developed is considered to be an ideal way to develop indicators, as the issues reflect a mandate of what the Clansthal stakeholders want and value the most. This ensures that the indicators are not only able to measure and monitor the environment, but are also able to measure progress towards, or deviation from, an 'ideal Clansthal', as reflected by the key issues presented by the various stakeholders.

6.3. The development of indicators for specific areas

The process of developing sustainability indicators for a particular area is a complicated one. Although there are a large number of sustainability indicators which may be utilized to measure and monitor the environment, they cannot all be applied to any circumstances. When sustainability indicators are developed for an area, the particular characteristics and constituents of the area need to be considered. This ensures that the indicators and their associated measures to are specific and appropriate for the management of the environmental systems which exist in the particular area.

The development of indicators for the Clansthal conservancy therefore required an initial determination of the key characteristics and constituents of the area, which was achieved through visits to the area, discussions with the conservancy members and the review of

relevant literature. Once the initial determination had been made, it was vital to identify sustainability principles which are key to the sustainability of the area. The particular environmental aspects present in Clansthal required consideration when developing the indicators, as they needed to be indicators and measures which would provide useful information on the specific environment in Clansthal, as well as information on the extent of achievement of the sustainability goals.

The development of the indicators as a part of the research for an EMP for the conservancy, was made somewhat easier due to the well resourced nature of the conservancy committee, as well as the expert knowledge which some of its members possess. This made the collection of data and the understanding of the issues in the conservancy less problematic, allowing the set of sustainability indicators which were developed for this particular area to be extensive and understandable to everyone.

6.4. Critical review of the indicators developed

6.4.1. Strengths of the indicators

The indicators which were developed meet many of the criteria which contribute to strong sustainability indicators, such as, they are relevant to the Clansthal area and inform the conservancy of what they need to know. Many of them do not need to be frequently measured, and the data which is required for their measurement is readily available to the conservancy. Many of them are also mappable in space and time, and have the ability to respond to changes in management practice and provide trends over time.

The indicators are also comprehensive, integrated and many of them address the long term. They were developed by a large amount of input from stakeholders and many of them are able to be understood by all members of the community. These are some of the criteria which the indicators meet, suggesting that they are well developed and may contribute greatly to the management of the Clansthal conservancy.

6.4.2. Weaknesses of the indicators

The indicators which were developed, although comprehensive and far reaching, could not incorporate all the factors which have an impact on the environment or all the measures which can be implemented to manage and improve the environment in Clansthal. This was partly due to the time constraints of the study, and partly due to the fact that there are a wide range of indicators which may be incorporated, and the lists are too extensive to incorporate into one project.

The amount of indicators developed is large, and therefore they can not all be used by the conservancy or other stakeholders to measure environmental aspects. This may also pose difficulties when decisions are made concerning a smaller number of indicators to use. However, the large number of indicators allows for a greater range of choices and allows for more creative implementation.

The measurability of the indicators may pose constraints as many of the indicators have a qualitative measure associated with them which may be difficult to implement in some cases. With indicators such as these, there is also room for interpretation, and different people may have different interpretations and views on how they should be measured.

Data collection for the indicators may present a challenge, as some of the indicators require the collection of highly scientific data. This may require specific equipment, or may be difficult for certain stakeholders to collect. There is also a fairly large amount of data which may need to be collected, making the collection of data a lengthy and complex process.

6.5. Use of the sustainability indicators

The indicators were developed for use by the conservancy, to ensure efficient and improved management of the ecological, social, economic and governance environment within the Clansthal conservancy. The role of the indicators in the management of the environment has extensive potential, especially for an area such as Clansthal which has a unique combination of environmental systems which require careful management. The

indicators may be used to measure many aspects of the environment, and may form the basis for management strategies within the Clansthal area which are aimed at managing or enhancing the environment.

The indicators which were developed may be utilized on their own or may be incorporated into other management tools, enhancing their success. They have the potential to be incorporated into tools such as state of the environment reports (SoE) or environmental management plans (EMP), which provide further information on the state of the environment, and the way in which it should be managed, respectively. Both of these tools benefit from the incorporation of sustainability indicators, as they provide a greater level of detail and specific measurements which may be used in the environment. An SoE provides information on the condition of the environment and natural resources, which may thereafter be managed by the implementation of an EMP. The conservancy hopes to develop an EMP for the area in the near future, and the indicators which have been developed will therefore feed into this tool and strengthen the management of the conservancy area.

The sustainability indicators which have been developed also have the ability to aid in the resolution of conflicts surrounding the trade offs which need to be made amongst the various environmental spheres in Clansthal. They may achieve this through providing valuable information on the state of the environment as well as the rates of change occurring within it, which will in turn allow more informed decisions to be made surrounding trade offs. This will occur as they will allow for the determination of which trade offs need to be made in order to ensure the long term sustainability of the Clansthal conservancy.

Due to the fact that the set of indicators which has been developed is very extensive, the conservancy committee has the responsibility of selecting a specific number of them which are felt to be the most vital within the context of the conservancy. This is required to be done in order for the sustainability indicators to be effectively implemented on their own, or within an EMP, as too many indicators will present problems in terms of data collection and monitoring.

A process for the collection of data and the measurement and monitoring of the environment must thereafter be decided upon. A group within the conservancy may therefore be delegated the responsibility of collecting the data which is required, and must thereafter store the data and update it over time. This is needed in order to determine changes occurring within the environment, and to ensure that all aspects of the environment are being efficiently monitored and managed.

The use of the indicators is primarily for the Clansthal conservancy, however, they may also be used by other stakeholders in Clansthal to measure and monitor the environment. These may include residents of the area who wish to monitor the local sustainability of their properties, or developers who wish to determine the state of the environment, and the impacts any developments may have on it. Local authorities, in their bid to ensure regional and national sustainability, may also find some of the indicators to be suitable for their purposes.

The indicators are not only useful for the management of the Clansthal conservancy. There are many conservancies within the eThekweni municipality as well as in surrounding areas for which indicators may be useful, as they allow management to be set within the broader environmental context. This study may therefore form the basis for future indicators as it has the potential to be adapted into a standardised process for the development of indicators by conservancies. This may allow the development process to be less complex, as other conservancies will not have to go through such extensive detail, and may simply adapt the process outlined in the study to meet their specific requirements.

The indicators or their development process may also be used by other organisations or management departments in order to facilitate the effective and efficient management of the environment within which they operate. They may simply be adapted, or a number of them selected in order to meet the specific needs of the area.

It can therefore be concluded that the use of sustainability indicators is vital, as they are able to contribute substantially to the effective and efficient management of the environment in many, if not all, circumstances. It is suggested that these indicators may

greatly contribute to the management of the Clansthal conservancy, and through this, may result in a sustainable community for present and future generations.

The study which was undertaken can therefore be determined to be a worthwhile and appropriate endeavour as the results of it are useful to a large extent. In the present neo-liberal economy where the environment is in constant competition with the pursuit of economic growth, tools such as sustainability indicators are essential to ensure that environmental management is sustainable to the largest degree possible. This study highlights the need for the use of sustainability indicators, as well as, not only aiding the Clansthal conservancy committee in the management of the conservancy, but also providing a basis upon which other conservancies and organisations may build in order to develop their own management systems in the future.

6.6. Future studies

Future studies surrounding the development of such indicators could focus on the scope for the implementation of sustainability indicators on a larger scale, and for inclusion within policies and legislation as a tool which facilitates effective environmental management.

References

Aguilar-Amuchastegui, N. and Henebry, G.M. (2007). Assessing sustainability indicators for tropical forests: Spatio-temporal heterogeneity, logging intensity, and dung beetle communities, *Forest Ecology and Management*, doi: 10.1016/j.foreco.2007.07.004.

Belfiore, S., Balgos, M., McLean, B., Galofre, J., Blaydes, M. and Tesch, D. (2003). A Reference Guide on the Use of Indicators for Integrated Coastal Management, Intergovernmental Oceanographic Commission.

Clansthal conservancy (2007). A Biodiversity Vision for Clansthal.

Common Ground Consulting (1998). Environmental Management Policy for the Durban Metropolitan Area, Durban Metropolitan Environmental Policy Initiative. Durban Metropolitan Council.

CSIR (2004). Monitoring and reporting on the state of the coast in South Africa: A discussion document on the strategic context. CSIR Division of Water, Environment and Forestry Technology. Pretoria.

CSIR (2005). Monitoring and reporting on the state of the coast in South Africa: A discussion document on the process to select indicators. CSIR Division of Water, Environment and Forestry Technology. Pretoria.

CSIR. www.csir.co.za . Accessed 16/02/07.

DAEA (2005). Invasive Alien Species Programme (IASP). agriculture.kzntl.gov.za. Accessed 04/09/07.

Dalal, R.C., Eberhard, R., Grantham, T. and Mayer, D.G. (2003). Application of sustainability indicators, soil organic matter and electrical conductivity, to resource

management in the northern grains region, *Australian Journal of Experimental Agriculture*, 43: 253-259.

DEAT (1998). National Environmental Management Act No. 107 of 1998. Department of Environmental Affairs and Tourism (DEAT). Pretoria.

Diederichs, N., Markewicz, T., Mander, M., Martens, A. and Ngubane, S.Z. (2002). eThekweni Catchments: A Strategic Tool for Planning. Urban Strategy Department.

EPA (2005). Marina Environmental Management Plan: A workbook for Marinas, Boatyards and Yacht Clubs in New England. United States Environmental Protection Agency New England.

EPI (1994). Ontario Round Table on the Environment and the Economy (ORTEEE) Round Table Talk, <http://www.brocku.ca/epi/sustainability/ORTEEE.HTM>. Accessed 05/08/07.

Ezemvelo KZN Wildlife, www.kznwildlife.com. Accessed 08/04/07.

Faber, N., Jorna, R. and Van Engelen, J. (2005). The sustainability of “sustainability”- A study into the conceptual foundations of the notion of “sustainability”, *Journal of Environmental Assessment Policy and Management*, 7(1): 1-33.

Ghosh, S., Vale, R. and Vale, B. (2006). Indications from Sustainability Indicators, *Journal of Urban Design*, 11(2): 263-275.

Glazewski, J. (2005). Water Law and the Environment, *Environmental Law in South Africa*. Second Edition. LexisNexis.

Guy, G.B. and Kibert, C.J. (1998). ‘Developing indicators of sustainability: US experience’, *Building Research and Information*, 26(1): 39-45.

Hermans, F. and Knippenberg, L. (2006). A principle-based approach for the evaluation of sustainable development, *Journal of Environmental Assessment Policy and Management*, 8(3): 299-319.

Kemmler, A. and Spreng, D. (2007). Energy indicators for tracking sustainability in developing countries, *Energy Policy*, 35: 2466-2480.

Kentucky Division of Compliance Assistance (2006). Environmental Management Plans: KY EXCEL Environmental Management Plans. Kentucky.gov. Accessed 16/02/07.

Kitchin, R and Tate, N.J. 2000. *Conducting Research into Human Geography*. Harlow: Prentice Hall.

Lehtonen, M. (2004). The environmental-social interface of sustainable development: capabilities, social capital, institutions, *Ecological Economics*, 49: 199-214.

Markham, R.W. (no date). Wildlife Management- The Wildlife Conservancy Concept. Ezemvelo KZN Wildlife. www.kznwildlife.com. Accessed 23/08/07.

Meter, K. (1999). Neighbourhood Sustainability Indicators Guidebook: How to Create Neighbourhood Sustainability Indicators in you Neighbourhood. Crossroads resource Center/ Urban Ecology Coalition.

O'Brien, R. (1998). An Overview of the Methodological Approach of Action research. www.web.ca. Accessed 30/08/07.

Oelofse, C. and James, N. (2001). Sustainability Indicators. School of Life and Environmental Sciences, University of KwaZulu-Natal.

Olewiler, N. (2006). Environmental sustainability for urban areas: The role of natural capital indicators, *Cities*, 23(3): 184-195.

Ott, K. (no date). The case for strong sustainability. Booklet 8. Greifswald University, Botanical Institute.

umwethik.botanik.uni-greifswald.de/booklet/8_strong_sustainability.pdf. Accessed 19/05/07.

Pretorius, R., Muller, E. and Balance, A. (2002). The South African Guide to Producing a State of the Environment Report. Department of Environmental Affairs and Tourism.

Reed, M.S., Fraser, E.D. and Dougill, A.J. (2006). An adaptive learning process for developing and applying sustainability indicators with local communities, *Ecological Economics*, 59: 406-418.

Roberts, D., Boon, R., Croucamp, P., Markewicz English cc, Geoff Nichols Horticultural Services, Myles Mander Environmental Services, Pravin Amar Development Planners, Garlicke and Bousfield Inc Attorneys, Palmer Development Group, Winstanley, Smith & Cullinan Attorneys, TH Nyasulu & Associates and MHP Geospace (2001). *eThekwini Environmental Services Management Plan, June 2001*. eThekwini Municipality. Durban.

Roberts, D., Boon, R., Croucamp, P., Markewicz English cc, Geoff Nichols Horticultural Services, Myles Mander Environmental Services, Pravin Amar Development Planners, Garlicke and Bousfield Inc Attorneys, Palmer Development Group, Winstanley, Smith & Cullinan Attorneys, TH Nyasulu & Associates and MHP Geospace (2003). *eThekwini Environmental Services Management Plan, June 2003*. eThekwini Municipality. Durban.

Sneddon, C.S. (2000). 'Sustainability' in ecological economics, ecology and livelihoods: a review, *Progress in Human Geography*, 24(4): 521-549.

Spangenberg, J.H., Pfahl, S. and Deller, K. (2002). Towards indicators for institutional sustainability: lessons from an analysis of Agenda 21. Sustainable Europe Research Institute.

StatPac (1997). www.statpac.com. Accessed 04/09/07.

Tourism Umdoni Coast and Country (2001). Sports Activities: Scuba Diving. www.scottburgh.co.za. Accessed 22/08/07.

United Nations Development Programme (no date). Agenda 21 Case Studies. www.undp.org.za/agenda21/agenda21.html. Accessed 10/08/07.

Valentin, A. and Spangenberg, J. H. (2000). A guide to community sustainability indicators. Wuppertal Institute for Climate, Environment and Energy.

citymaps.durban.gov.za. Accessed 12/03/07.

users.iafrica.com. Accessed 02/08/2007.

www.getawaytoafrica.com. Accessed 16/02/2007.

www.socialresearchmethods.net. Accessed 04/09/07.

www.southcoasthappenings.co.za. Accessed 23/08/2007.

www.sustainablemeasures.com. Accessed 27/03/2007.

Yuan, W., James, P., Hodgson, K., Hutchinson, S.M. and Shi, C. (2003). Development of sustainability indicators by communities in China: a case study of Chongming City, Shanghai, *Journal of Environmental Management*, 68(3): 253-261.

Appendix 1: Questionnaires from interviews conducted

a) **Questions for the Clansthal Conservancy**

Section A: General questions on Clansthal

1. Please list three things that you like about Clansthal?
2. Please list three things you would like to change about Clansthal?
3. How important is the natural environment to Clansthal?

Very important	
Fairly important	
Not important	

Explain your answer.

4. How would you characterize the natural environment in Clansthal?

Pristine/ Natural	
In a good condition	
Degraded	

Explain your answer

5. What are the key challenges facing the Clansthal area?
6. a) Are any of these issues being measured/ monitored?
6. b) If yes, how are they being measured?
Do you have records and where are these kept? Who uses them
7. What is the role of the Clansthal conservancy in the area?
8. Are there ways in which your local knowledge is utilized to manage or measure the environment in Clansthal?
9. Who is responsible for managing the environment in Clansthal?
10. Who should be responsible for the management of the environment in Clansthal?
11. What kind of relationship does the conservancy have with the local authority tasked with managing this area? Explain.

Section B: Environmental Services

1. What are the critical environmental assets in the Mahlongwana Catchment?
2. How does the Clansthal Conservancy aim to maintain and enhance the environmental services provided by the critical environmental assets?
3. What was the approximate cost of the damage caused by the March 2007 extreme waves?
4. What impacts has the storm damage had on Clansthal?
5. How would you rate the quality of the Mahlongwana River?

Good	
Average	
Poor	

Explain your answer.

6. a. Are you aware of pollution in the Mahlongwana River?
6. b. If so, how often have you seen pollutants in the Mahlongwana River ?

Daily	
Weekly	
Monthly	
Quarterly	

6. c. Where does this pollution come from?
7. a. Does the Mahlongwana River flood?
7. b. If so, how often and when?
8. What impacts does this flooding have on Clansthal?
9. Which properties are susceptible to flooding during rainfall events?

10. What is the condition of the Mahlongwana estuary?

Good	
Average	
Poor	

11. Describe the ecology and organisms of the estuary?

12. Describe the type of vegetation in the area?

13. What agricultural products are farmed in the Mahlongwana Catchment?

14. Do these products impact on the environment? Explain.

15. How do you feel about the conversion of sugar cane to other land use in the Clansthal area?

16. What kind of leisure activities exist in and around Clansthal?

17. Do you think that there is a market for Eco-tourism in the Clansthal area?
Explain your answer.

Section C: Development Alternatives

1. What environmental benefits can the proposal for alternative land use, proposed by the Conservancy for the Shoals site, bring to Clansthal?
2. What socio-economic benefits can the proposal for alternative land use, proposed by the Conservancy for the Shoals site, bring to Clansthal?
3. What is your preferred vision for Clansthal in the future?
4. a) How do you feel about the Shoals Development?
4. b) What aspects, if any, of the proposed Shoals Development are acceptable to you?
5. How do you think developments like the proposed Shoals development will impact on the sense of place and identity of the area?

Section D: Demographic information

1. Do you live in Clansthal?
2. If yes, how long have you lived in Clansthal?

3. How long have you been a member of the Conservancy?

4. Age

<30	30-40	41-50	51-60	61+

5. Gender

Male		Female	
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6. Occupation

b) Questions for residents

Section A: General questions on Clansthal

1. Please list three things that you like about Clansthal.
2. Please list three things you would like to change about Clansthal.
3. How important is the natural environment to Clansthal?

Very important	
Fairly important	
Not important	

Explain your answer.

4. How would you characterize the natural environment in Clansthal?

Pristine/ Natural	
In a good condition	
Degraded	

Explain your answer.

5. What are the key challenges facing the Clansthal area?
6. Do you feel that these challenges are being addressed?
7. If yes, by whom are these challenges being addressed?
8. If no, who do you think should be addressing these challenges?
9. Do you know about the Clansthal conservancy? What do you know about it?
10. If yes, have you had any involvement with the conservancy, or been requested to be involved?
11. If so, how have you been involved?
12. Are there ways in which your local knowledge is utilised to manage or measure the environment in Clansthal?

Section B: Indicators and quality of environment

- 1.1. How would you rate the quality of the Mahlongwana River?
- 1.2. Are you aware of pollution in the Mahlongwana River? What type of pollution?

Good	
Average	
Poor	

- 1.3. If so, how often have you seen pollutants in the Mahlongwana River?

Daily	
Weekly	
Monthly	
Quarterly	

- 1.4. Where does this pollution come from?
- 2. Who is responsible for managing the environment in Clansthal?
- 3. Who should be responsible for the management of the environment in Clansthal?

Section C: Environment

- 1. Why did you move to Clansthal?
- 2. If you own a coastal property, is there natural dune vegetation present?
- 3. Are you concerned about the shifting edge of the coastline (i.e. further wave damage)? Explain.
- 4. What was the approximate cost of the damage caused by the March 2007 extreme waves?
- 5. What opportunities are there for ecotourism in Clansthal?
- 6. What kind of leisure activities exist for residents and tourists in and around Clansthal?
- 7. What are the critical environmental assets in the Mahlongwana Catchment?
- 8. Are you aware of exotic or alien invasive species within the Clansthal area?

- How do you feel about the conversion of sugar cane to other land use in the Clansthal area?

Section D: The future of Clansthal

- What is your preferred vision for Clansthal in the future?
- What key issues do you think need to be considered when new developments are proposed for areas like Clansthal?
- Are you aware that a residential development called ‘The Shoals’ has been proposed for the Clansthal Area?
- If yes, how do you feel about a large gated estate being developed in this area?
- Have you attended any meetings related to the proposed Shoals Development?
- Have you provided any input for the proposed Shoals Development?
- How do you think developments like the shoals development will impact on the sense of place and identity of the area?

Section E: Demographic information

- How long have you lived in Clansthal?
- Where did you live before you moved to Clansthal?
- Do you know your neighbours? Do you interact with them, on what basis?
- Does Clansthal have a good community feeling? Explain your answer.
- Do you own this property?

Yes		No	
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- Do you rent this property?

Yes		No	
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- Age

<30	30-40	41-50	51-60	61+

8. Income

<R5000	R5001-R15000	R15001-R25000	R25001+

9. Gender

Male		Female	
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10. Family structure of household. Please give numbers

Adults	
Children	

d) Questions for Andrew Mather

1. During March and June 2007, the eThekweni coastline experienced extreme wave conditions. Do you think the coastline is vulnerable to similar risks in the future?
2. When was the last time a similar event occurred along the eThekweni coastline?
3. What was the estimated cost of damage caused to the eThekweni coastline by the 2007 extreme waves?
4. How were these figures determined?
5. Are there any cost figures for eThekweni's south coast?
6. What structures can be used to protect the coastline from such damage?
7. What is the approximate cost of these structures?
8. Which of these structures do you think are the most effective?
9. What measures can be undertaken by the general public so as to proactively minimize coastal damage?
10. Were areas with natural vegetation on the primary dunes along the coastline as prone to damage as areas which have been modified by human activity?
11. In terms of coastal maintenance, which areas along the eThekweni coastline have the highest cost?
12. Which area along the eThekweni coastline have the lowest cost in terms of coastal maintenance?
13. Which is the most costly in terms of coastal damage along the eThekweni south coast?
 - a. A river catchment with high levels of sediment transported into the ocean
 - b. A river catchment with low levels of sediment transported into the oceanPlease give a reason for your answer.
14. Along the Clansthal coastline, the morphology of the coastal zone has changed due to the erosion of sand banks. Do you think this form of damage will be permanent?
15. When looking at eThekweni's southern coastal zone, what do you consider critical environmental assets?
16. Are there any measures taken by eThekweni to protect these critical environmental assets? Please explain answer.
17. How would you rate the quality of the coastline at Clansthal?

18. It is a well known fact that the coastal zone is facing pressure to transform from a natural to developed state. What implications would this have in terms of coastal damage?
19. Clansthal is one of only two green catchments in eThekweni. It is currently not highly developed but is under pressure for development. How do you feel about the future development in this area?
20. Is there any value in the argument that Clansthal should be protected as it represents only a small section of the eThekweni coastline that is not highly developed?
21. Are you aware of the Clansthal conservancy and what they do? Would it be appropriate for you to form a partnership with this conservancy to protect the coastline in this area?

e) **Questions for Penny Croucamp**

1. a. What is the value of Clansthal to the city?
1. b. How do you feel about the current developments proposed for Clansthal?
2. What are the key environmental assets in Clansthal?
3. What are the key environmental challenges in the area?
4. Clansthal was considered one of only two green catchments in the city- How should this shape/ or play a role in future decision making in the area?
5. Are you aware of the Clansthal conservancy? What do you know about the conservancy? Do you/ should you have a relationship with the conservancy?
6. What are your views on the scoping phase for the Shoals Development- should this be a full EIA? Is your position still the same as stated in your latest e-mail?

f) Questions for Narend Singh

1. What three things do you like about Clansthal?
2. What three things would you change in Clansthal?
3. What is your vision for the Clansthal area?
4. What is your vision for the development you have proposed?
5. For how long have you owned the land here?
6. What are the critical environmental issues (biophysical and social) that need to be addressed in decision making in Clansthal?
7. What could be done to ensure that the views of all stakeholders in Clansthal are addressed in relation to all future development plans?
8. What should the role of the eThekweni Municipality be?
9. What is the status of the Shoals development application?
10. What critical issues have emerged in relation to this proposal?
11. Why have you joined the conservancy?
12. What do you think the role of the conservancy in the area should be?
13. What do you hope to achieve as a member of the conservancy?
14. How do you feel about the alternatives proposed for the Shoals land by the Conservancy?
15. Could the Shoals EIA be used to develop a more integrated and deliberative approach to environmental decision making in the area? Explain your answer.

g) Questions for Blue Environmental Consultants (Neville Hattingh)

1. What are the critical environmental issues (biophysical and social) that need to be addressed in decision making in Clansthal?
2. What is your vision for the Clansthal area?
3. What is the developers vision for the Clansthal area?
4. What could be done to ensure that the views of all stakeholders in Clansthal are addressed in relation to all future development plans?
5. What should the role of the eThekweni Municipality be?
6. Does the IDP/SDF shape environmental decision making in the area?
7. What is the status of the Shoals development application?
8. What critical issues have emerged in relation to this proposal?
9. What are your views on the role of the conservancy in the area?
10. How do you feel about the alternatives proposed for the Shoals land by the Conservancy?
11. Could the Shoals EIA be used to develop a more integrated and deliberative approach to environmental decision making in the area? Explain your answer.