RHODES UNIVERSITY
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Evaluating the sustainable management of the State indigenous forests in the Eastern Cape Province

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ABSTRACT

This research assesses the state of sustainability of State indigenous forests in the Eastern Cape and provides recommendations to improve their sustainability. The Eastern Cape Indigenous Forest Management Audit (ECIFMA) report of 2009 provided the primary data for this assessment (DAFF, 2009). The research was inspired by the fact that the global challenge of forestry destruction and degradation where the extent of forests is being reduced at an alarming rate of 6% annually. It became essential for global leaders to develop policies and strategies that sought to promote sustainable forest management. The monitoring of sustainability of forests was only possible through use of globally and nationally developed sets of criteria and indicators.

Eleven forest estates responsible for the management of State indigenous forests in the Eastern Cape were selected for this research. The choice was influenced by the availability of audit data from the ECIFMA report of 2009. This report contained performance information of 41 indicators under 18 criteria for monitoring sustainable forest management as extracted from the PCI&S assessment checklist developed for monitoring the sustainability of indigenous forests in South Africa (DWAF, 2005). The data was refined using the MCA methods (ranking and scoring) as described by Mendoza and Prabhu (2000). These methods yielded to the determination of the performance of indicators of forest sustainability. It was thus important to conclude the research by responding to the following questions:

- What is the state of sustainability of the State indigenous forests in the Eastern Cape?
- What recommendations could be made to improve the sustainability of State indigenous forests?

It was found that the State indigenous forests were not managed in a sustainable manner. The research report is concluded by providing concrete recommendations to improve forest sustainability.

DECLARATION

I hereby declare that this dissertation is my own original work which has not been submitted at any other university for degree purposes and that all references have been duly acknowledged.

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NKOSIPENDULE QUVILE **DATE**

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AHP	Analytic Hierarchy Process
APO	Annual Plan of Operations
CAR	Corrective Action Request
C&I	Criteria and Indicators
CIFOR	Centre for International Forestry Research
CSD	Composite Sustainable Development
CSFM	Committee on Sustainable Forest Management
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DWAF	Department of Water Affairs and Forestry
ECIFMA	Eastern Cape Indigenous Forest Management Audit
EPWP	Expanded Public Works Programme
FAO	Food and Agriculture Organisation
FCCC	Framework of Convention on Climate Change
FMU	Forestry Management Unit
FSA	Forestry Services Aid
FSC	Forestry Stewardship Council
GFRA	Global Forest Resource Assessment
GHGs	Green House Gases
ICSD	Integrated Composite Sustainable Development
IDC	Industrial Development Corporation
IFF	Intergovernmental Forum on Forests
IIED	International Institute for Environment and Development
IPF	Intergovernmental Panel on Forests
ITTO	International Tropical Timber Organization

IUCN	International Union of Conservation of Nature
MCA	Multi-Criteria Analysis
MCDM	Multi-Criteria Decision Making
MCPFE	Ministerial Conference on Protection of Forests in Europe
NFA	National Forests Act
MP	Montreal Process
NFAC	National Forestry Advisory Council
NGO	Non Governmental Organization
NSDS	National Sustainable Development Strategies
PCI&S	Principles, Criteria, Indicators and Standards
PFMC	Participatory Forest Management Committee
SFM	Sustainable forest Management
SME	Small and Medium Enterprise
SMME	Small, Micro and Medium Enterprise
UN	United Nations
UNCED	United Nations Conference on Environmental Development
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFF	United Nations Forum on Forestry
WCED	World Commission on Environment and Development

CHAPTER 1: INTRODUCTION

1.1 Introduction

This chapter presents the background and context of the research to justify the need for assessing the state of sustainability of State indigenous forests in the Eastern Cape. There is increasing destruction of the indigenous forests at international, national and provincial level (Siry and Cubbage, 2003:14). The Eastern Cape Province is not an exception as it presents empirical examples of degradation and destruction of forests in Port St Johns and Ngqeleni, which are congruent to international empirical examples. This chapter describes the international initiatives which seek to improve the sustainability of global forests (e.g. Global Forest Resources Assessment). In this regard, this research seeks to build from the international and national experiences to assess and improve sustainability of indigenous forests in the Eastern Cape.

1.2 Background and context of the research

In the past few decades, global indigenous forests have been severely subjected to destruction and degradation, to create open spaces for agricultural expansion and exploitation of forestry resources as a safety-net in poverty stricken countries, despite the call made in the World Commission on Environment and Development (WCED) of 1987 that the world should strive to protect at least 12% of forests annually (Siry and Cubbage, 2003:14). These indigenous forests are globally considered as the major carbon sinks that provide investment opportunities for carbon trading. However the destruction of these forests poses a threat to climate change (DeFries *et al.*, 2007:385).

The Food and Agriculture Organisation (FAO) initiated a programme called Global Forest Resource Assessment (GFRA) programme in 2005 (Wijewardana, 2008:15). This programme aimed at collecting information about forests globally to assist and guide forestry sector

managers in making meaningful and relevant decisions to improve the sustainability of forests (Wijewardana, 2008:115). In spite of the use of this information from the Global Forest Resource Assessment (GFRA) programme to improve sustainability, the deforestation rate continues to exceed re-forestation rate globally. As noted by Wijewardana (2008:116) the world continues to lose 6 million ha of natural forests on annual basis through forest destruction and unsustainable logging. This destruction continues to exacerbate the effects of climate change through attracting the most destructive insects and diseases. These are detrimental to the remaining forests, and cause severe loss of productivity in many forests (Wijewardana, 2008:116). Mapedza (2007:833) observed that the demand of natural resources by the surrounding communities exacerbates illegal destruction and degradation of indigenous forests, which in turn accelerates the negative effects of climate change.

The tracks of forest degradation have been observed in many State indigenous forests particularly in the Pondoland coastal indigenous forests e.g. Ngqeleni and Port St Johns forests (Obiri *et al.*, 2001:132). This degradation is largely caused by the communities which clear forest land to plant agricultural crops such as maize and dagga plants (*Cannabis sativa*). In spite of these challenges of destruction and degradation to the forests, the State indigenous forests in Eastern Cape are still rich in biodiversity e.g. mangrove forests in Port St Johns.

In South Africa, the indigenous forests cover an area of ± 400 000 ha in extent, which are only 0.1% of the total land cover in South Africa (Grundy and Wynberg, 2001:1 and Bethlehem, 2000:4). According to DWAF (2007:17), indigenous forests in the Eastern Cape Province cover an area of 226 997 ha in extent, mainly concentrated along the Amatola mountain range and Wild Coast areas. Almost 70% of the indigenous forests in the Eastern Cape are managed by the State (Obiri *et al.*, 2001:132).

The State indigenous forests in South Africa have been under severe pressure in the last few years due to heavy dependency of poor rural people on these forests as their source of energy such as fuel wood and construction timber for construction of kraals, buildings and fencing

(Shackleton *et al.*, 2007:558). This challenge is also common in other underdeveloped and developing countries (Bogahawatte, 2003:9 and Bahuguna, 2000:126). Although the majority of rural communities depend on the wood for fuel, a greater number of people in South Africa also use indigenous forests as their source of medicine. The influx of users or consumers of these can be observed queuing in both Durban and Johannesburg *muti* markets (Shackleton *et al.*, 2007:558). Prior to 1994, rural black communities were denied access to these indigenous forests for these resources in South Africa due to an unprecedented threat to the forest ecosystems. In the Eastern Cape province, the indigenous forests are not only used for subsistence consumption by local communities, they are also used for the production of commercial indigenous timber (e.g. yellow wood and black wood timber species in the Amatola indigenous forests for furniture manufacturing and Umsimbeet (*Milletia grandis*) for walking sticks in Pondoland indigenous forests) (Obiri *et al.*, 2001:131).

1.3 Rationale for the research

FAO (2008:9) claims that State indigenous forests in South Africa are not sustainably managed. This claim is justified by the empirical examples observed in some of the State indigenous forests (i.e. Port St Johns and Ngqeleni forests) situated along the coast line of the Eastern Cape (Obiri *et al.*, 2001:131). South Africa has developed a set of Principles, Criteria, Indicators and Standards to monitor the sustainability of its forests (Bethlehem, 2002:1).

In 2009, the State appointed external experts with more than 25 years of auditing experience combined, to conduct audits in all 11 forest estates in the Eastern Cape. They used the approved set of criteria and indicators framework for forests in South Africa. The approach to the audits was to visit, observe and assign relevant performance scores to indicators in these 11 forest estates based on Principles, Criteria, Indicators and Standards (PCI&S) assessment tool (DAFF, 2009). This audit was conducted in the presence of managers of the respective forest estates with the intent of transferring the skills to them. The project was concluded by the presentation of the data collected from the field to the management of forests in the Eastern Cape. The report did not

provide detailed analysis of performance data of indicators as this was not part of the assignment.

Consequently, this research sought to expand from the audit project of 2009, by providing critical analysis of the presented audit data to determine the state of sustainability of indigenous forests and further provide concrete recommendations to improve the sustainability of indigenous forests.

In order to effectively address the objective of this research, it is necessary to respond to the following questions:

What is the state of sustainability of the State indigenous forests in the Eastern Cape? In order to respond to this question, it is important to understand the standards as outlined in the set of criteria and indicators for sustainable forest management in South Africa. These standards are the benchmarks of scores assigned to indicators during field observation. Therefore it is easy to observe the performance of the indicators against the set standard. The analysis of the audit data will provide an insight on the state of sustainability of these forests. In order to give justice to this question the following hypothesis is used:

> H_0: The State indigenous forests in the Eastern Cape Province are not managed in a sustainable manner.
>
> H_1: The State indigenous forests in the Eastern Cape Province are managed in sustainable manner.

What recommendations could be made to improve the sustainability of State indigenous forests? Once the state of sustainability is known it will be easier to identify performance gaps in the management of the forests. These performance gaps will guide the recommendations to improve the sustainability of the forests in future.

1.4 Structure of the research

This chapter started by providing the context and background of the research with specific focus on international, national and local perspectives of sustainable development and sustainable forest management. It also described the rationale of the research and concluded by providing an overview of the upcoming chapters.

Chapter 2 provides a comprehensive analysis of the concepts of sustainable development and sustainable forest management, which provide a framework to improve the sustainability of global forests. This also describes the response of forestry sector to the international initiatives that sought to promote sustainable development and sustainable forest management.

Chapter 3 describes methods used for collating data from eleven selected forest estates and the adopted research design for the study. It also describes the PCI&S assessment tool for sustainable forest management that was used during the audit process and discusses methods of aggregation and the analysis of existing audit data.

Chapter 4 presents the findings on the state of sustainability in all the forest estates under study.

Chapter 5 discusses results together with associated theory to provide appropriate recommendations to improve the sustainability of indigenous forests.

Chapter 6 provides conclusion of the findings of the research report.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter provides information on the origin and definitions of the concept of sustainable development since the early 19th century, as understood by different sectors and organisations. As indicated in many articles, the concept of sustainable development is complex and requires models and methods to simplify it for easy implementation of its multiple indicators (Krajnc and Glavic, 2005:205). As a result of its complexity, this concept has attracted many criticisms which often lead to abuse by culprits perpetuating unsustainable actions (Robinson, 2004:373). However, the uncertainty was removed when the Brundtlandt report provided a more internationally accepted definition of sustainable development. This chapter also discusses how other countries responded to the international call to promote SFM in their respective countries post UNCED of 1992, and how unsustainable activities negatively impact climate change.

In this chapter a relationship between the concepts of sustainable development and sustainable forest management is traced with particular focus on their common goal of pursuing sustainability. This chapter also describes how countries have re-aligned their policies and strategies to comply with the requirements of sustainable forest management. The chapter discusses the role played by the three major international fora established post UNCED of 1992 and the flow of debates leading to the global shift towards sustainable forest management. The process of developing tools that support the monitoring of SFM is described, as well as the CIFOR initiative which led to the development of a set of Criteria and Indicators for the SFM framework. This framework guides the reporting on SFM by many countries. It is also observed that the complexity of criteria and indicators inspired many academic researchers and scientists to conduct relevant studies that led to simpler methods such as Multi-Criteria Analysis and Analytical Network Process.

2.2 Origin of the concept of sustainable development

As noted by Srivastava (2011:100), sustainable development has been practised since the beginning of human civilisation when people were living in harmony with plants and animals. During that time, people were able to select plants and animals for protection purposes. Later, development became biased towards economic growth and social justice and excluded environmental concerns. However, the environmentalists were concerned with the neglect of environment and started initiatives that sought to protect the environment, such as "Earth Day", which was to educate the society on the impact of human activities on the environment (Edwards, 2005:14). This initiative inspired the government of the United States of America to pass legislation such as the Clean Air Act and the Clean Water Act and to establish an Environmental Protection Agency that sought to protect the environment. However, sustainable development was discussed without an explicit understanding of its meaning, for example the International Conference for Rational Use and Conservation of Biosphere organised by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) held in Paris in 1968 (Faber *et al.*, 2010:349). These initiatives were escalated to an international level and discussed at the United Nations Conference on Human Environment of 1972, which was held in Stockholm (Edwards, 2005:15). The conference provided a platform to bring international awareness of the environmental and development challenges affecting the Earth (Quental *et al.*, 2011:18). The conference further attempted to find positive links between the environment and economic concerns (Edwards, 2005:16). According to Edwards (2005:16), the conference fostered the establishment of environmental protection agencies by participating countries.

It is notable that the concept of sustainable development was first used in the world conservation strategy developed by the International Union of Conservation of Nature (IUCN) in 1980. This was in pursuit of a balance between environmental concerns and socio-political concerns on human development (Liu, 2003:460). The emergence of the sustainable development concept brought an understanding and awareness of balancing human activities and nature (Hopwood *et al.*, 2005:38).

As noted by Hopwood *et al.* (2005:40) and Liu (2003:460), the sustainable development concept has evolved from a period in which it was given many definitions which led to different interpretations and responses by a number of organisations and experts. However, Munier (2006:10) and Quental *et al*. (2011) agree that the definition in the Brundtlandt commission report of 1987 remains widely accepted.

As observed by Quental *et al*. (2011:15) the sustainable development concept became a buzzword in the Brundtlandt commission report of 1987 also known as "*Our Common Future"*. The concept of sustainable development is defined as development that seeks "to meet the needs of the present generation without compromising the ability of future generations to meet their own needs" (Hanway, 1990:510). Sustainable development is not a fixed state of harmony but a dynamic process of changes (Liu, 2003:460). Sustainable development indeed has a potential to resolve the fundamental challenges facing human beings in the present and the future generations.

In this light, sustainable development "involves the use of the vital functions of the biophysical surroundings in such a way that they remain indefinitely available" (Hueting and Reijnders, 1998:139). Sustainable development has an ability to integrate economic prosperity, environmental protection and social justice often known as the triple bottom line (Jamali, 2006:809 and Elkington, 2005).

Nearly two decades after the Brundtlandt report of 1987, the concept of sustainable development remained most important in tackling the challenges of the changing world (Sneddon *et al.*, 2006:253). However, the conceptualisation and practising of sustainable development principles in the developing world was not legally binding but depended on the willingness of participating countries to embrace the principles for the sake of saving the environment.

2.3 Critics of sustainable development

Some of the criticisms associated with the sustainable development concept were inspired by the vagueness and uncertainty of the concept, resulting in a plethora of definitions. This uncertainty around the definition of the concept often enabled culprits to justify their unsustainable actions. These culprits argue that sustainable development must be defined in the context of political environment (Springett, 2003:71). In support of this argument both Robinson (2004:373) and Partridge (2005:3) agree that different definitions associated with the concept perpetuated vagueness that often attract different interpretations which enable the culprits to hide their unsustainable development actions, for example the use of hydrocarbon fuels and chemicals, which are limited and damaging to the atmosphere, to perpetuate contemporary development (Norgaard, 1988:606). There has been a paradigm shift to eliminate the vagueness of the concept of sustainable development where environmentalists and NGOs prefer to use sustainability concept rather than sustainable development because the sustainable development concept is shadowed with vagueness. The word 'development' is more synonymous with growth which perpetuates economic growth (Moffatt, 2000:360). The perception amongst some of the private sector organisations is that sustainable development was introduced to force them to integrate environmental protection and social responsibility into their development agenda (Moffatt, 2000:360).

It is also notable that some definitions of sustainable development concept are biased towards the anthropocentric context with the exclusion of biocentric context (Lee in Hopwood ***et al.***, 2005:39). Springett (2003:71) confirms that reports on the ecological footprint indicate that human development activities perpetuate unsustainable development. However, Beckerman (1994:191) supports the school of thought that the definition of sustainable development is morally unacceptable because of its bias to environmental sustainability, overriding other considerations that support human well-being.

Despite the fact that the Brundtlandt report of 1987 provided a platform for the creation of institutional frameworks leading to the development of policies and strategies supporting sustainable development, the implementation of those policies and strategies by United Nations (UN) countries remains questionable (Harding, 2006:229). The slow progress of the implementation of the policies and strategies could be ascribed to a number of factors such as the controversy on the interpretation of the sustainable development concept and lack of coordination of financial resources by UN countries to implement national policies (Volkery *et al.*, 2006:2047).

2.4 Sustainability assessment methods

There is increased recognition of the usefulness of sustainability indicators and indices to convey information on the performance of countries and corporate sectors in terms of environmental, economical and social dimensions. A study conducted by Singh *et al.* (2009:206) evaluated 41 existing sustainability indices or models (including the composite sustainable development index) that are used to measure sustainability using three key steps (normalisation, weighting and aggregation). The findings of the study revealed that normalisation and weighting are associated with subjectivity which depends on individual judgement, while aggregation is more objective in nature. However a Composite Sustainable Development index displays many advantages because of elements of multi-dimensionality of ratings and composite indices. This also embraces the integrative approach on environmental, economic and social dimensions (Singh *et al.*, 2009:209). Hence the following paragraphs focus on describing the composite sustainable development model which will be used later in this study to measure sustainability of the forests.

In recognising the complexity of assessing sustainable development with multiple indicators, Krajnc and Glavic (2005:189) designed a model called the Composite Sustainable Development (CSD) model. This model aggregates the performance indices of environmental, economic and social indicators to an integrated CSD index (I_{CSD}) as illustrated in Figure 2.1, in order to determine the state of sustainability of an organisation under assessment. This model is now

widely used by a number of organisations across the world to determine their state of sustainability (Singh *et al.*, 2009:189). Figure 2.1 depicts a 3-level scenario where I_{CSD} is at the highest level, Sustainability Sub-indices (I_S) at the Middle level and Normalised Indicators (I_N) at the lowest level. A Composite Sustainable Development Index is the aggregated index of the weighted environmental, economic and social sustainability indices. The sustainability index is calculated by summing up all the weighted indicator indices and indicates the level of sustainability of the organisation under assessment.

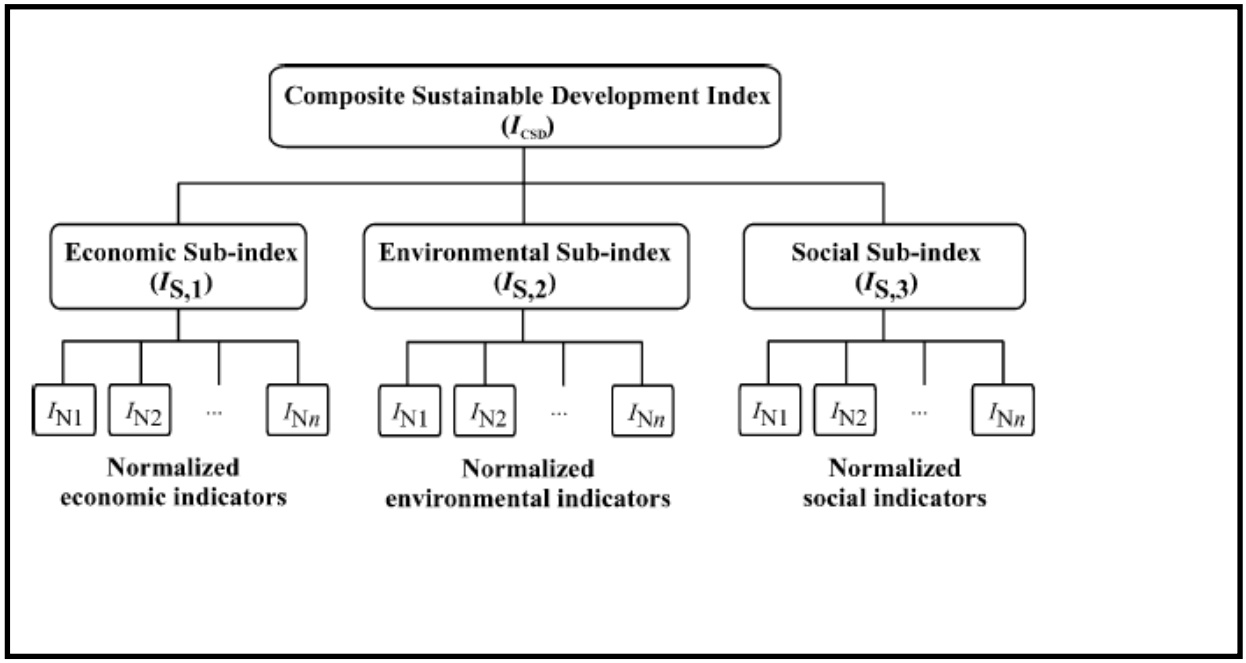

Figure 2.1: Generic hierarchy scheme for calculation of composite sustainable development index (Krajnc and Glavic, 2005:189)

Figure 2.2 below shows the steps of calculating the value of a CSD Index, which begins by selecting all relevant indicators to determine the state of sustainability of an organisation. This step is followed by grouping indicators under a particular sustainability group (e.g. economic, environmental and social groups). Each indicator is judged on whether it has a positive or negative impact on a group e.g. emission of greenhouse gases has a negative impact on the environmental group, while profits accrued have positive impact on the economic group. In

some instances the indicators are expressed in different units which create complexity when calculating higher level indices. In correcting this challenge, the values of indicators are normalised by dividing the current indicator index by the mean indicator index value over a given period. The indicators are assigned weights using the Analytic Hierarchy Process (AHP) or ranking method. The values of the sustainability indices are calculated by aggregating the weighted indicator index values under a particular sustainability group. The I_{CSD} is calculated by determining the mean value of all sustainability indices.

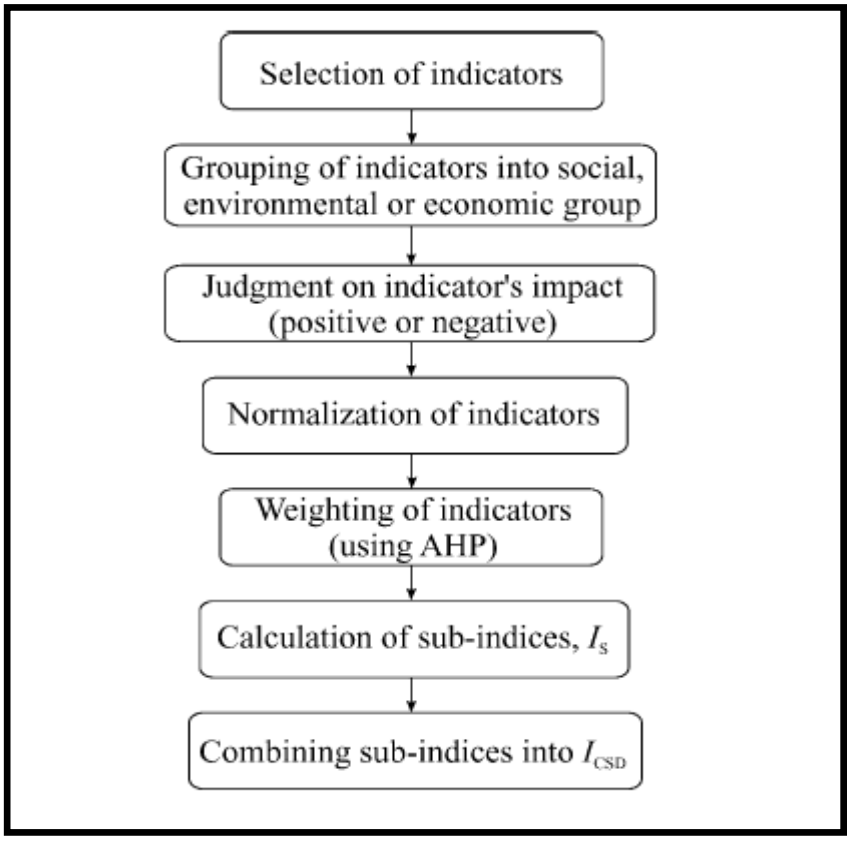

Figure 2.2: The procedure of calculating the *I*CSD (Krajnc and Glavic, 2005:189)

2.5 Response to sustainable development strategies

Volkery *et al.* (2006:2047) note that the United Nations made a call to all UN developed and developing countries to develop their national sustainable development strategies (NSDS). Subsequently, a review was done to assess how these countries responded to this United Nations call, using a sample of 19 countries. The findings of the review reveal few success stories and many failures despite the fact that they had five years to develop such strategies (Volkery *et al.*, 2006:2048). As noted by Volkery *et al.* (2006:2048), a review was once again conducted 10 years after the 1992 UNCED and still very little progress had been made by both developed and developing countries. Failures were ascribed to lack of coordination of national budget, poor implementation of sub-national level strategies and other national level strategies. In view of the findings of the review, Volkery *et al.* (2006:2060) suggests the introduction of incentive schemes to inspire the implementation of NSDS and penalties which should be given to those countries which are not implementing their strategies. Meadowcroft (2007:152) observes that non-implementation of the strategies can be attributed to the cosmetic nature of strategies which become difficult to implement. Despite the generally slow progress in implementing strategies in most countries, European countries are exceptional as their implementation of strategies was progressing (Meadowcroft, 2007:152).

Some countries responded positively to the call of the United Nations and as a result they began to develop their country-specific NSDS. The Costa Rican government is one of the few countries that developed a conservation strategy for sustainable development under the Ministry of Natural Resources in the early 1990s, in recognition of the dependency of sustainable development on the existence of renewable natural resources (Quesada-Mateo and Solis-Rivera, 1990:396). According to Ahmad (1992:879), even underdeveloped countries such as Bangladesh started discussions on developing the strategies and policies for promoting sustainable development. However, it is necessary to note that the effective implementation of these policies and strategies is critical to realise the benefits of sustainable development.

2.6 Climate change and sustainable development

Sustainable development is linked with the innovation and efficient use of natural resources which lead to a positive impact on both humans and the environment. However the negative impact of human activities leads to unsustainable development, which is associated with the excessive emission of Green House Gases (GHGs) of which $CO_{2,}$constitutes 82% of total GHGs (Damtoft *et al*., 2008:116). An increase in the concentration of GHGs in the atmosphere causes the ozone layer to become thinner, which in turn makes it easy for sun rays to heat the earth and radiate back to the atmosphere. In the atmosphere these sun rays are trapped by the GHGs which ultimately cause the warming of the earth (climate change) (Damtoft *et al*., 2008:116). According to Redclift (1992:33) climate change originates from wasteful consumption of energy (unsustainable use of energy) that increases GHGs concentration in the atmosphere and thereby increases the hole in the ozone layer. Thus climate change can be defined as the ongoing change of climate caused by the concentration of GHGs in the atmosphere in a particular area, country, continent or the entire earth. Although climate change and sustainable development concepts are defined and discussed in different circles by policy makers and researchers, there is a strong relationship between them (Swart *et al.*, 2003:S19). For example the stabilization of GHG concentration in the atmosphere will depend on the path taken by socio-economic development dimensions.

Pielke and Sarewitz (2005:265) argue that the definition of climate change in the Framework of Convention on Climate Change (FCCC) does not take into consideration the impact of societal change on human and environment, hence it is too narrowly focused on the impact of human activity on the change of atmospheric composition, in addition to the natural change of climate which occurs over time. Politicians also use the negative effects of climate change such as hurricanes and floods which impact on society, to garner political support through their reactive approaches.

2.7 Sustainable forest management: perspective

One of the major achievements of United Nations Conference on Environment and Development (UNCED) in 1992 was the development and adoption of Agenda 21 and its forestry principles, which seek to encourage public participation in the decision-making processes on matters of environment. Pulzl and Rametsteiner (2002:262) and Hickey *et al*. (2007:572) note that despite the fact that this adoption was not legally binding, it enjoys great support from international community. The UNCED inspired international debates on forests, which gained momentum post-UNCED, and fostered the United Nations Commission on Sustainable Development to establish two fora dealing with forestry matters: the Intergovernmental Panel on Forests (IPF) and the Intergovernmental Forum on Forests (IFF), to discuss issues of forestry policy (Humphreys, 2001:125). These fora were mandated to deliberate on matters concerning sustainable forest management. According to Humphreys (2001:125), both IPF and IFF processes pursued the proposal of Action Plan to open a dialogue on sustainable forest management matters. This dialogue sought to encourage many countries to realign their policies and strategies to achieve the requirements of sustainable forest management. Purnomo *et al*. (2004:111) observe that the United Nations has established another forum, the United Nations Forum on Forests (UNFF), to strengthen the debate of sustainable forest management in the international agenda by building from the work of the IPF and IFF. The newly established forum was a special purpose vehicle, which led to a Ministerial declaration that was reached and presented in the World Summit on Sustainable Development of 2002 held in Johannesburg.

According to Varma *et al.* (2000:50) the Helsinki process (Pan European process) is one of the prominent international processes, which endorsed the sustainable forest management agenda in its resolutions, with the understanding that the sustainable forest management concept seeks to harmonize economic, environmental and social interests of present and future generations. In addition, Wiersma *et al*. (2010:7) and Gee and Stratford (2001:55) strongly emphasize that sustainable forest management (SFM) is also about maintaining and enhancing the lasting health of forest ecosystems. The triple bottom line often omits the cultural aspect which Wiersma *et al.*

(2010:7) include for a complete definition of SFM. In SFM, the forests should continue to provide multiple products and services to infinity without necessarily changing their state or condition (Norton and Miller, 2001:27). However Varma *et al.* (2000: 50) note that there was no globally accepted definition of the SFM in the mid-90s and this concept was defined broadly as merely an extension of the concept of sustainable development.

However, sustainable forest management concept is now widely defined as "the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems" (Karsenty *et al.*, 2008:1499).

Pulzl and Rametsteiner, (2002:260), Cubbage *et al.* (2007:833), Wolfslehner *et al.* (2005:157), and Mendoza and Prabhu (2003) agree that sustainable forest management is the most prominent concept since the UNCED of 1992 which has been highly debated in both environmental and forest policy agenda worldwide. Further, this concept became dominant in the circles of the management of global forests, particularly tropical forests. This concept was also most preferred by both academics and researchers (Mendoza and Prabhu, 2000:107). The advent of the sustainable forest management concept inspired many government and non-governmental organizations to launch many initiatives promoting sustainable management of forests mainly through the support of the International Tropical Timber Organization (ITTO). One of these initiatives was the development of a set of criteria and indicators for sustainable forest management by the Center for International Forestry Research (CIFOR). In many international processes, such as the Helsinki and Montreal processes, leaders in both public and private sectors took important decisions to ensure the success of sustainable forest management agenda.

Worldwide concern on the sustainable management of forestry resources prompted international initiatives, such as the development of criteria and indicators for sustainable forest management. However, the selection and evaluation of these criteria and indicators by different groups (e.g.

communities and non-governmental organizations) remain subjective because of the different perspectives of different stakeholders' groups in terms of the relevancy and importance of these criteria and indicators.

Cubbage *et al.* (2007:833) and Gluck (2000:177) confirm that the effectiveness of the policies of sustainable forest management depend on gathering of appropriate information on economic, environmental, social and multiple-use opportunities offered by the forests for the benefit of present and future generations. Prior to the advent of sustainable forest management, forest owners used to concentrate on the production of timber products and services, where most of their profits were derived, and ignored non-timber goods and services that could be of value to the society (Klooster, 2010:117). This inspired the establishment of the Forestry Stewardship Certification body which played a vital role in encouraging the participation of forestry organizations to include conservation of natural forests and consideration of social values in their forest policy development processes.

According to McDonald and Lane (2003:63), the forest policy-makers started to recognize the need to pursue biodiversity conservation concurrently with the promotion of forest productivity and social responsibility to communities which depended on the forests for their livelihoods. McDonald and Lane (2003) further observe that policy makers have exerted more effort in developing policies on achieving sustainable forest management, guided by the principles, criteria and indicators that are globally accepted. Prabhu *et al.* (1999:11) describe these elements in detail as follows (also see CIFOR generic principles, criteria and indicators in Appendix 3:

> **Principle**: A fundamental law forming the basis of reasoning. In the context of SFM it is regarded as a primary framework that guides the management of forests in a sustainable manner (e.g. for the SFM to be achieved, forest ecosystem integrity must be maintained and the well-being of humans must be assured).
>
> **Criterion**: This is a second order principle which is described as a principle in which something is judged. This is also described as the intermediate point where information

gathered from the indicators is integrated to present a single view on the state of performance (e.g. for achieving forest ecosystem integrity, principal functions and processes of forest ecosystems must be maintained).

Indicator: Any variable that describes or infers the status of a criterion. This always conveys a single message (information) to the criterion (e.g. the implementation of processes for the maintenance of forest ecosystems).

Prabhu *et al.* (1999:14) present a simple hierarchical structure to describe the relationships between principles, criteria, indicators and verifiers in Figure 2.3 below.

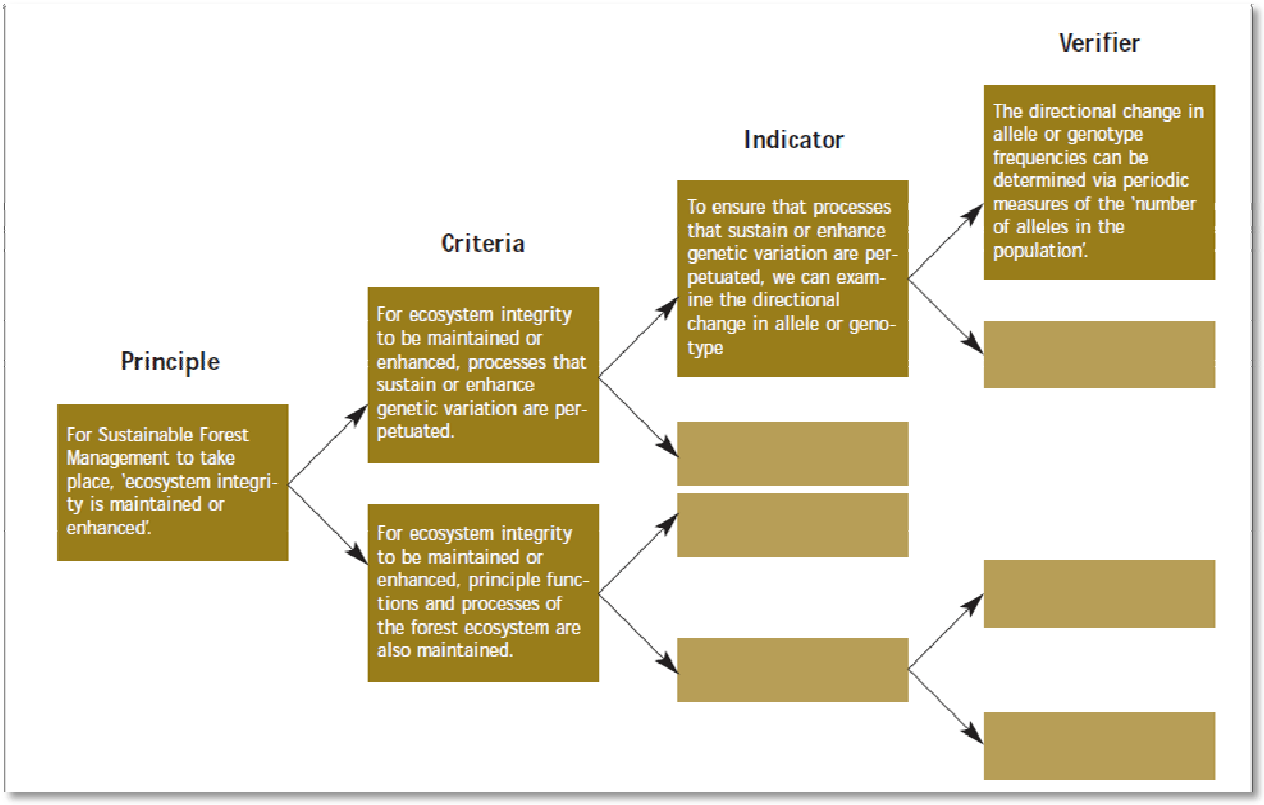

Figure 2.3: Example of information links in C&I Hierarchy (Prabhu *et al.*, 1999:14)

According to Scotcher and Everard (2001:1), the forestry industry in South Africa started to embrace principles of sustainable forest management as early as 1989 when it first developed guidelines for environmental conservation management of forests without being influenced by international or government processes. Although these guidelines were never up scaled into a level of criteria and indicators, they were used by the accredited bodies such as the Forestry Stewardship Council (FSC) to monitor compliance on sustainable forest management principles. In 2002, 60 500 ha of indigenous forests in South Africa were certified and issued a certificate by the FSC (Scotcher, 2006:1; Kok and Vermeulen, 2002:319).

Hickey (2008:109) notes that Agenda 21 of UNCED of 1992 sets to create a platform for countries to develop policies and strategies on sustainable forest management. The former Ministry of Water Affairs and Forestry started negotiations with the forestry industry players to discuss matters pertaining to transformation of the forestry sector immediately after the election of the Government of National Unity in 1994 (Louw, 2004:66). At the beginning, these negotiations between the government and the forestry industry yielded no positive results as some private sector organisations withdrew themselves from the negotiations after finding difficulties in agreeing on elements that they thought would be able to shape the outlook of the forestry sector. Nonetheless, the Ministry continued debating these issues despite the non-participation of the private sector members. The first product of negotiations was the proclamation and publication of the White paper on sustainable forest development in March 1996 (Scotcher and Everard, 2001:1). It was difficult to implement the white paper despite the fact that a National Forest Action Programme was in place and a legal instrument was suggested. This was followed by the promulgation of the National Forests Act (NFA) (84 of 1998), which provided a legal framework for development and implementation of criteria and indicators for sustainable forest management (Scotcher and Everard, 2001:1). After the promulgation of NFA (84 of 1998), the Minister of Water Affairs and Forestry appointed the National Forestry Advisory Council (NFAC) to advise the Ministry on matters of sustainable forest management in South Africa (Scotcher and Everard, 2001:1).

2.8 Criteria and indicators for sustainable forest management

Maini (1993, in Makundi, 1997:141) defines criterion in a policy context as "a distinguishing characteristic of an instrument that provides policy framework" while Lopez-Ridaura *et al.* (2004:52) and Prabhu *et al.* (1998), define a criterion as a standard that a judgment should be based to determine the sustainability of forests. Lopez-Ridaura *et al.* (2004:52) and Maini (1993, in Makundi (1997:141) suggests that an indicator is a measurable variable for a criterion. However Prabhu *et al.* (1999:11) provide widely accepted descriptions of these elements as indicated in Section 2.5 above.

Brand (1997:248) suggests a framework to demonstrate the relationships between criteria and indicators for sustainable forest management as illustrated in Figure 2.4. There are three levels which determine the state of sustainability of forests: the lower level is characterized by the indicators which are grouped under a particular criterion in the middle level i.e. there are many indicators under each criterion as shown in Appendix 3 The criteria in the middle level determine the scope and output of sustainable forest management at the higher level (sustainable forest management level).

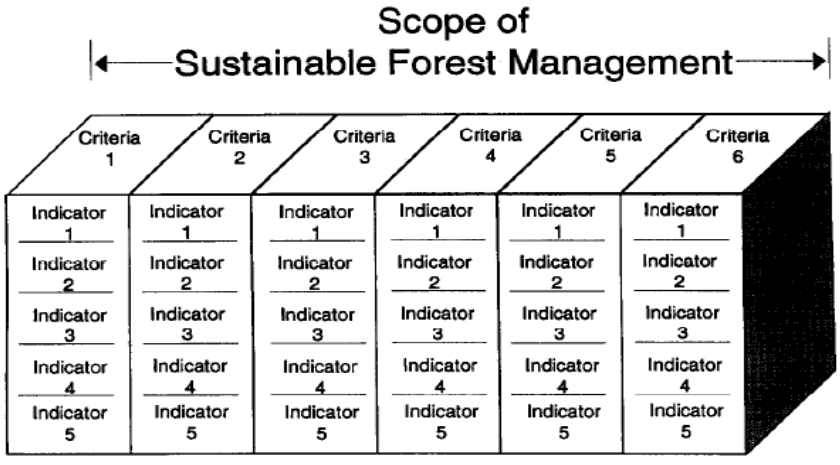

Figure 2.4: A framework for visualizing the relationship between criteria and indicators and a definition of sustainable forest management (Brand, 1997:248)

The development of criteria and indicators started before the UNCED of 1992 by the International Timber Trade Organisation (ITTO) to monitor and achieve the sustainability of tropical forests of member countries. This yielded the development of five national and six working level criteria (Brand, 1997:248). The UNCED of 1992 was able to recognise the need for the development of international criteria and indicators for sustainable forest management in terms of agreed forestry principles. However, a comprehensive process of development of criteria and indicators started as early as in 1993. A seminar of experts with expertise on sustainable development of boreal and temperate forests was funded with a specific mandate to develop and define principles, criteria and indicators (PC&I) for monitoring sustainable forest management, setting the scene for the development of PC&I by the member countries responsible for boreal and temperate forests, building up from the resolutions of Rio declaration taken during the UNCED in 1992. These boreal and temperate forests were chosen because they were severely degraded by human activities. Most of these forests are concentrated in the northern hemisphere (e.g. 41% in Canada and 32% in Russia) and the degradation was mainly due to over-cutting of timber (Norton, 1996:1). The degradation of these forests had severe negative impacts on the biological diversity at species, ecosystems, population and genetic levels. In many instances the species diversity was dramatically reduced and some species became extinct. It was therefore imperative that policies were developed to promote conservation of biological diversity of forests. This requires a great effort to adequately assess the biodiversity of forests and integrate the information in the planning processes as well as developing policies that are generally accepted by society. This process was conducted in Montreal, Canada and led to the development of the so called Montreal process criteria and indicators. This process is one of three international initiatives (the others being the ITTO and Helsinki processes) that made significant progress on development of criteria and indicators to guide reporting on sustainable forest management by 85 member countries (Wijewardana, 2008:117). Although it was easy to identify and define the environmental criteria, there were some difficulties experienced in defining the social and economic criteria associated with the forest sustainability. As a result only two of the seven criteria described social and economic criteria (Wijewardana, 2008:119).

However, the Montreal process yielded to the development of seven criteria and 67 indicators which were adopted by the member countries (McDonald and Lane 2004:65). These Montreal criteria and indicators were affirmed during Santiago declaration in 1995 representing 90% of boreal and temperate forests in the world (Reynolds *et al.*, 2003:433). The member countries further committed themselves to implement these criteria and indicators to monitor sustainability of their forests as reflected in Table 2.1 below.

Table 2.1: The Montreal Process Criteria and Indicators (McDonald and Lane, 2004:65)

	MP criteria	No of Indicators
1	Conservation of biological diversity—including the elements of diversity of ecosystems, the diversity between species and genetic diversity in species	9
2	Maintenance of the productive capacity of forest ecosystems—including forest land availability, forest products outputs	5
3	Maintenance of forest ecosystem health and vitality including disturbances such as diseases and pests, pollution and biological components such as seed availability nutrient cycling	3
4	Conservation and maintenance of soil and water resources—including the conservation of soil and water resources and the protective and productive functions of forests	8
5	Maintenance of forest contribution to global carbon cycles	3
6	Maintenance and enhancement of long-term multiple social and economic benefits to meet the needs of societies including the production and consumption of wood products, employment and investment recreation, cultural, social and spiritual needs and values	19
7	Legal, institutional and economic framework for forest conservation and sustainable management	20

Another international initiative was the Ministerial Conference on Protection of Forests in Europe (MCPFE) held in Helsinki in 1993 to promote European forestry strategy for sustainable forest management, often called the Helsinki process (Wolfslehner and Vacik, 2008:1; and Wolfslehner *et al.*, 2005:158). This process culminated in the development of six criteria illustrated in Table 2.2 (McDonald and Lane, 2004:66). These criteria are similar to the Montreal

criteria with the exception of one which deals with the management issues that are embedded within the outcome of each Montreal criterion. The suitability of these criteria for sustainable forest management was first tested in 1994/5 by the expert group and follow-up testing was done in 1996 (Hickey *et al.*, 2007:573). The findings revealed a great variability on the quantity and quality of data collected from the European countries, which led to difficulties in comparing the suitability of criteria and indicators in the European countries.

Table 2.2: The Helsinki Process Criteria and Indicators (McDonald and Lane, 2004:66)

	Criteria
1	Maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles
2	Maintenance of forest ecosystem health and vitality
3	Maintenance and encouragement of productive functions of forests (wood and non-wood)
4	Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems
5	Maintenance and appropriate enhancement of protective functions in forest management (notably soil and water)
6	Maintenance of other socio-economic functions and conditions

Unlike the above two important international initiatives, the International Timber Trade Organisation consists of members from the commodity producers and consumers of tropical timber and this was established to facilitate discussions and sharing of information on policies of world tropical timber economy (McDonald and Dale, 2004:66). As at September 2000, this organisation had 56 members representing 95% of the world tropical timber trade and 75% of the world's tropical forests. This organisation further elaborated its criteria and indicators for SFM without the involvement of political commitment and these were adopted by other non-European countries such as Malaysia (Rametsteiner and Simula, 2003:91).

The three most important processes (Montreal, Helsinki and ITTO) of nine international processes for development of criteria and indicators were compared and found to be similar to each other in terms of content, scope and philosophy, as illustrated in Table 2.3 below (McDonald and Dale, 2004:67).

Table 2.3: Comparison of Montreal, European (Helsinki) and ITTO criteria (McDonald and Lane, 2004:68)

	Criteria and Indicators	MP Criteria	European Criteria	ITTO Criteria
1	Conservation of biological diversity	1	4	5
2	Maintenance of the productive capacity of forest ecosystems	2	3	2 and 4
3	Maintenance of forest ecosystem health	3	2	3
4	Conservation and maintenance of soil and water resources	4	5	6
5	Maintenance of forest contribution to global carbon cycles	5	1	Not Included
6	Maintenance and enhancement of long-term multiple social and economic benefits	6	6	7
7	Legal, institutional and economic framework for forest management	7	Incorporated in 1–6	1

Wijewardana (2008:115) notes that criteria and indicators are widely accepted as powerful tools for monitoring sustainable forest management. The significant impact of these tools was evident when more than 150 countries started using the criteria and indicators in reporting progress towards achieving sustainable forest management. Nonetheless Gough *et al.* (2008:425) contend that there are still countries which have not yet applied C&Is and some countries are already applying C&Is in assessing SFM but not in an effective manner. Although the indicators were

developed by many countries in accordance with their prevailing local conditions, it is still imperative that international common indicators be developed (Gough *et al.* (2008:425).

Mendoza and Prabhu (2000:107) recognise and support the use of a generic set of criteria and indicators for the SFM framework which were developed by the Center for International Forestry Research (CIFOR), to evaluate the sustainability of all types of forests as summarised in a hierarchical structure in Figure 2.5.

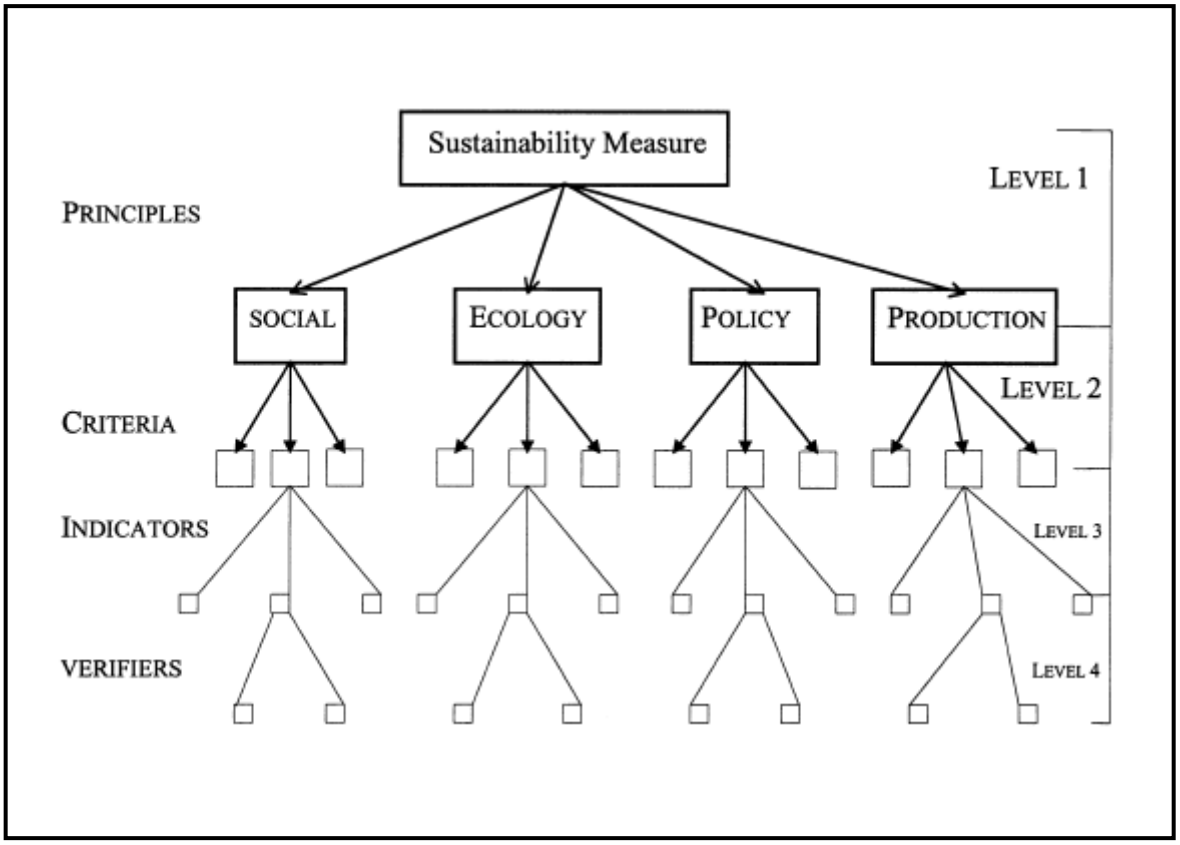

Figure 2.5: Hierarchical structure of C&I (Mendoza & Prabhu, 2000:109)

However this set consists of a long list of criteria and indicators which are not necessary relevant for certain types of forests (see Appendix 3). Therefore Mendoza and Praphu (2000:108) suggest the use of Multi-criteria decision making (MCDM) tools to select and evaluate the relative

importance of multiple and complex criteria. Three MCDM techniques (i.e. ranking, rating and pair-wise comparison) were tested and evaluated to determine their relevance and importance in selecting and evaluating the importance of complex sustainability criteria or indicators. Generally, the MDCM is an effective tool for prioritising the elements of sustainability ranging from principles to indicators, because it displays transparency and creates a participatory environment for all stakeholders (Mendoza and Prabhu, 2000:118). Ananda and Herath (2009:2543) agree that the MDCM tool is relevant and can improve decision-making in the management of forests. The ranking (regular and ordinary) and rating techniques are found to be simple and easy to apply, especially for the multiple criteria and indicators, although they display many features of subjectivity compared to the pair-wise comparison, which is complex with a high degree of consistency and offers close evaluation of one-on-one criteria or indicators. The results in Balana *et al.* (2010:1301) show no significant difference in relative weights calculated using the rating and pair-wise comparison techniques, both techniques identifying the same most important indicators and criteria. Ranking and rating techniques are quite relevant for evaluating relative importance of a long list of criteria and indicators, while the pair-wise comparison technique is relevant for a short list of criteria and indicators (Mendoza and Prabhu 2000:119). For this study, a ranking method is preferred to determine the relative importance of a long list of indicators (41 indicators) relevant to assess the state of sustainability of indigenous forests in the Eastern Cape.

In addition to the abovementioned techniques of the MDCM tool which determines the relative importance of criteria and indicators, the cognitive mapping technique (soft methodology) assesses interaction, linkage and connectivity within criteria and indicators (Mendoza and Prabhu, 2003:329). Unlike other MDCM techniques, such as ranking, rating and pair-wise comparison, which are prescriptive in nature, a cognitive mapping technique is descriptive in nature, displaying broad insights (Mendoza and Prabhu, 2003:332). This technique is more concerned with the overall cumulative impact of all the indicators, individually and collectively, to define overall sustainability of forests. This technique was applied by Adrianto *et al.* (2005:20) in assessing the local sustainability of the fisheries system in Yoron Island, Japan, and

the findings revealed that the linkages (soft methodology) and importance of sustainability indicators are relevant for incorporating in the MDCM processes.

To complement the MCDM tool Varma *et al.* (2000:49) designed a computer-based Decision Support System to overcome the challenges of the multi-functionality of forest resources when assessing sustainable forest management. The significance of this method is its ability to integrate the diverse economic, ecological and social criteria and a multitude of variables for sustainable forest management at forest management unit level. Furthermore, this system integrates both spatial and non-spatial data to support a Geographic Information System based multi-criteria analysis to effectively assess sustainable forest management.

According to Reynolds *et al.* (2003:433), a logic-based system for evaluating the sustainability of forests was found to be more clear and consistent as it guides expert judgement in determining the relationship between ecological, economic, social and institutional criteria (see Figure 2.6).

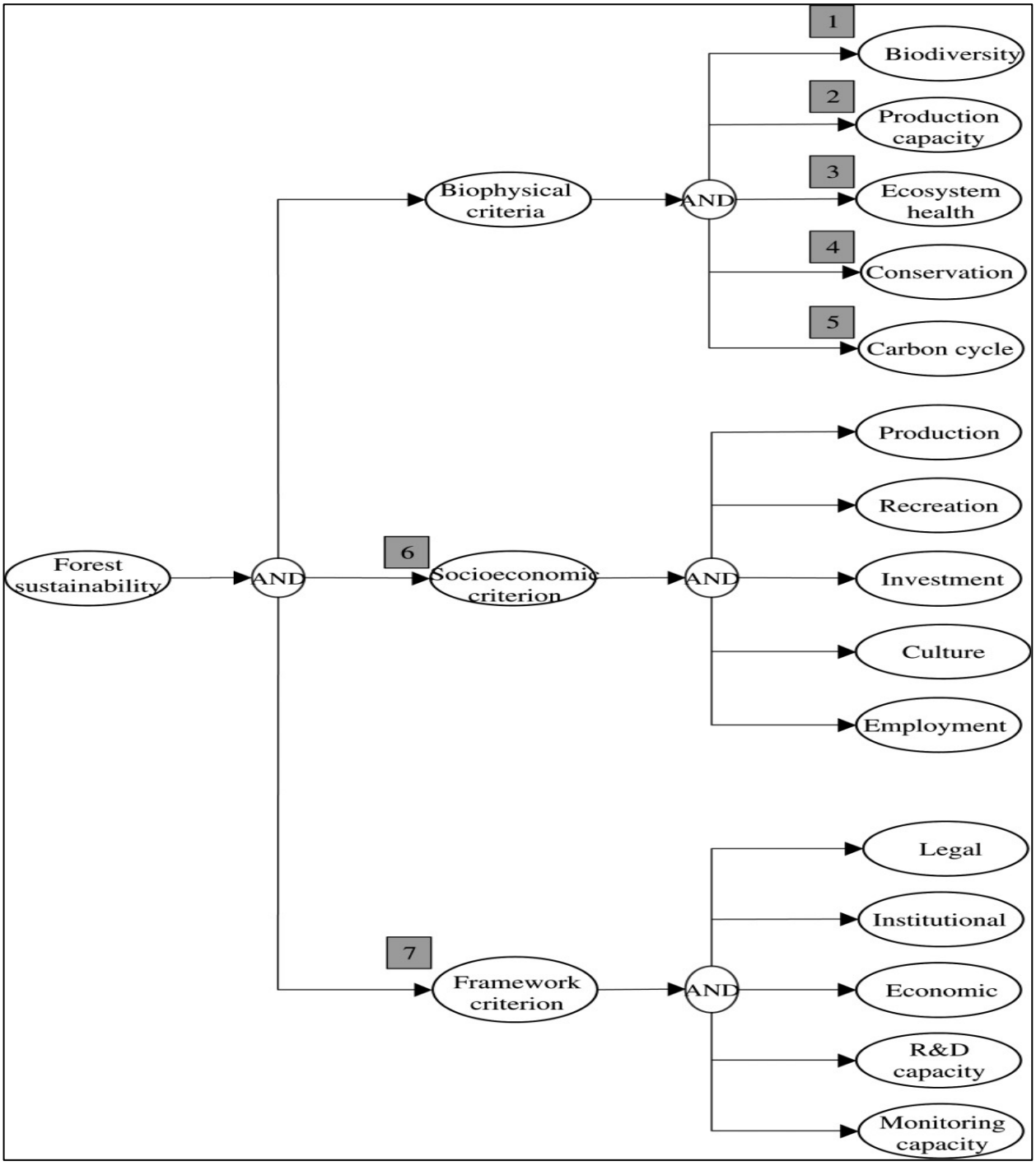

Figure 2.6: Relationship between ecological, economic, social and institutional criteria (Reynolds *et al.*, 2003:437)

Parkins *et al.* (2001:44-45) argue that a local level approach of developing communities will fail if relevant social indicators are not considered and integrated with environmental and economic indicators to ensure forest sustainability, because developmental approaches tend to embrace the "community development" realm instead of the "sustainability".

Social indicators are not easy to select or identify compared to economic and environmental indicators, and this suggests the selection and identification of the appropriate social indicators using a social impact assessment framework (Vanclay, 2010:101).

According to Dale and Beyeler (2001:3), ecological indicators are developed to assess the condition or state of the environment and provide an early warning signal for anticipated problems that can cause serious damage to the environment. The ecological indicators are significant in the conservation of the environment but there are limitations to their use, including the use of too few ecological indicators which leads to the failure to consider the ecological system holistically. Dale and Beyeler (2001:5) argue that the selection of ecological indicators is often based on management programs with unclear goals and objectives, and management programs usually lack scientific drive, resulting in poor identification and selection of appropriate ecological indicators. Despite the negative comments on selecting ecological criteria, they are easier to define than socio-economic indicators. Ecological indicators that best describe the full complexity of the ecosystem should at least possess the following criteria: easy to measure, simple to understand by non-scientists, respond to ecosystem stresses, be predictable and anticipated, and be integrative (Dale and Beyeler (2001:6).

Failing and Gregory (2003:121) identify ten common mistakes which are often encountered during the process of developing forest ecological indicators. These mistakes are attributed to the failure to determine the value basis of indicators as well as integrating values and science when developing indicators which are concise, relevant and meaningful to decision-makers. This often leads to a confused public and decision makers and frustrated professionals. However, these mistakes can be corrected through integration of values, science and decision-making. Despite

the challenges experienced in the development of ecological indicators, these indicators were found to be useful in conducting forestry inventory and analysis (Miles, 2002:175). Shields *et al.* (2002:149) note that in most cases the indicators are not understandable to the general public or society, who often prefer the use of indices in communicating sustainable forest management information, although they are often understandable by the scientists, policy makers and decision makers.

The process of developing criteria and indicators in South Africa started in 1999 using the CIFOR C&I template as a guide to the development process (Scotcher and Everard, 2001:1). A legal framework such as section 3 of the National Forests Act no. 84 of 1998 provided principles of sustainable forest management where the criteria and indicators were developed (Bethlehem, (2002:1). As in other major international processes, South Africa has used a group of experts organised by the Institute of Natural Resources to develop, test and refine a set of criteria, indicators and standards. This process culminated in the development of 23 criteria under four key categories: environmental, economical, cultural and social (Oelofse *et al.*, 2006:61).

2.9 Application of criteria and indicators by forest certification schemes

In realising that forests were increasingly being depleted, the Forestry Stewardship Council (FSC), which is an international organisation based in United States of America, together with other certifying non-governmental organisations (NGOs) started to develop strategies or interventions that sought to reduce the depletion of forests. FSC introduced an ecological certification method for forest products described as 'green labelling', which compelled participating forest sector organisations to implement the FSC set of criteria and indicators for monitoring SFM .This was essential to be competitive in international trade of forestry products and services (Kiker and Putz, 1997:37). Concurrently, FSC started raising awareness of consumers to procure timber goods and services from certified forests. Thus, forest certification provided assurance and confidence to consumers of forest products produced from organisations that were complying with sustainable forest management principles (Kiker and Putz, 1997:38).

In essence, the criteria and indicators' development process by FSC aimed at regulating the market of timber products and services by ensuring compliance of forestry sector organisations to ecological and social indicators for the sustainability of their forests (Kiker and Putz, 1997:38). According Kiker and Putz (1997:38), the goals of forest certification are as follows:

1) To promote awareness of the relationship between the forestry industry and environment to the consumers.
2) To enhance consumer confidence and acceptance.
3) To transform the behaviour of consumers.
4) To mutate the behaviour of timber manufacturers.
5) To improve the quality of the earth environment.
6) To promote forest product differentiation.
7) To expand forest product market share.
8) To provide an objective audit of the management of forest assets.
9) To promote sustainable management of forest assets.
10) To justify the fact that forest management provide the social, economic and ecological benefits in a sustainable manner.

Figure 2.7 illustrates the key components of ecological certification processes.

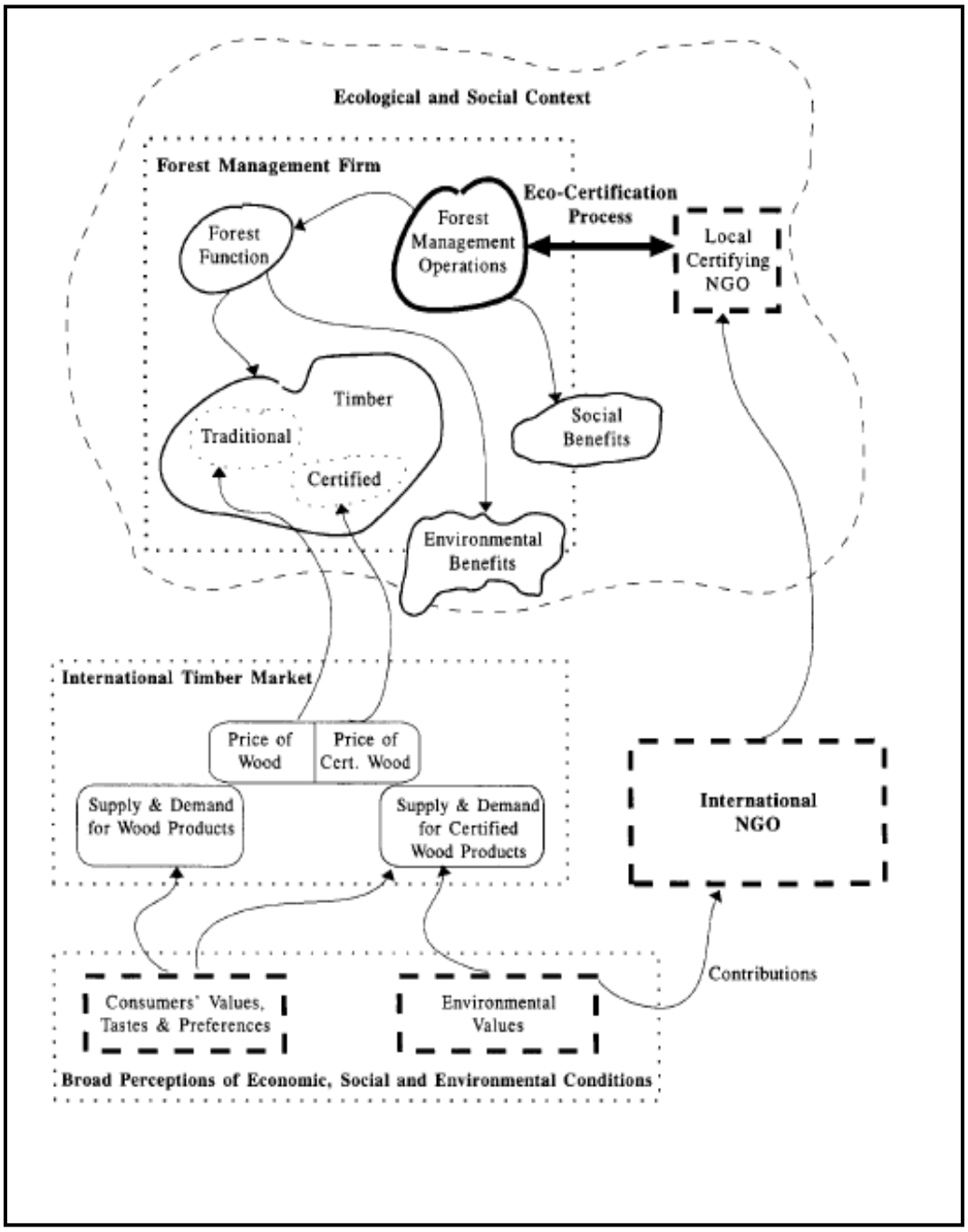

Figure 2.7: Scheme of fundamental concepts underlying ecological certification (Kiker and Putz, 1997:39)

The upper portion of the Figure 2.7 shows the relationship between the certifying organisation (usually a non-governmental organisation) and the forest management firm. This relationship often focuses on operations in the forest and also includes the chain of custody in the forest product market channels. The lower portion of Figure 2.7 illustrates the platform created by the institutions and global market forces for the operation of the forest certifying organisations, the forest management firms and certification processes. In this case, the perceptions of economic, social and ecological conditions of forests by a broader public influence the market of forest products and viability of certifying organisations.

Rametsteiner (2002:163) observes that forest certification schemes were started by private interest groups with the sole purpose of reversing the downturn trend in terms of quality and quantity of global forests by improving their sustainability. Despite the introduction of these forest certification schemes, global forests continued to deteriorate (Rametsteiner, 2002:163). Interestingly, forest owners contend that forest certification schemes are established not solely to drive the global timber market but to discourage governments from setting stringent regulatory frameworks (Gulbrandsen, 2004:142). For example, if forest owners were not ignoring the protection of environment aspects of their forests, the need for the governments to set regulatory measures would not be there. Thus, the role of governments becomes critical to develop legal frameworks and provide finance for setting up governmental forestry certification schemes (Rametsteiner, 2002:164). The FSC scheme is considered as one of the most appropriate, successful and legitimate forest certification schemes in the world (Verdonk ***et al.***, 2007:3911), largely due to the fact that FSC meets most of the standards set for forest certification schemes (e.g. promotion of access to procedure and structures by participating members).

Since the inception of forest certification schemes, the global response resulted in more than 124 million ha of forests being certified by different certification schemes, constituting 3.2% of world forests in 2002 (Rametsteiner and Simula, 2003:87). Rametsteiner and Simula (2003:87), and Siry ***et al.*** (2005:551) agree that despite the difficulties experienced in the operation of forest certification schemes, the process has successfully raised the awareness and knowledge of

managing forests in a sustainable manner. In South Africa, the southern Cape State indigenous forests were certified by FSC in 2002 and were the first State indigenous forests to be certified under the FSC scheme (Kok and Vermeulen, 2002:319). These indigenous forests cover an extent of 60 500 ha, which is almost 15% of the total area of indigenous forests in South Africa (Geldenhuys, 1991:51).

2.10 Reporting on sustainable forest management

There is significant progress towards sustainable forest management globally in the policy and science fields (Hickey, 2008:109). However, SFM is still faced with a number of challenges. These challenges include unreliability of collected information, budget constraints and political processes, which lead to deforestation at an alarming rate where forest area is decreasing by 6 million ha per annum as at 2005 (Hickey 2008:110). Wijerwardana (2008:116) notes the further decrease of the forest area by 9 million ha as at 2006. Despite these challenges, the Global Forest Resource Assessment (GFRA) Report of 2005 revealed good performance towards SFM in 229 countries, assessed based on the seven SFM criteria (Montreal process criteria). However, in North America the results showed positive trends towards SFM while in the southern hemisphere they showed negative trends. Building from the Montreal process criteria, the British Columbia in Canada (North America) was able to select and define 83 indicators relevant for reporting on the sustainability of forests in the Frazer River Basin of British Columbia in Canada, using the acceptable modelling techniques that best describe linkages between the indicators (Gustavison *et al.*, 1999:117). Notwithstanding the negative trends on SFM in the southern hemisphere, New Zealand is singled out as one of the few countries which signed international agreements committing themselves to report on progress towards SFM using seven Montreal process criteria (Richardson *et al.*, 1999:125). Australia adopted a modified set of Montreal process criteria, which yielded significant improvement in the management of its forests. It is notable that Australia has agreed to continue improving the state of reporting on sustainability of its forests, using these criteria (Howell *et al.*, 2008).

2.11 Summary

This chapter has traced the evolution of the concept of sustainable development since the early 19th century. In this evolution process, different opinions, definitions and interpretations of the concept of sustainable development have been presented. These include a widely accepted definition of the SD concept espoused in the Brundtland report of 1987. The chapter also noted the criticisms associated with the vagueness and biasness of the concept, and susceptibility to abuse as a result of uncertainty. The effects of non-compliance to sustainable development principles led to the climate change problems affecting the society of today. This chapter described the processes that led to the UNCED of 1992 which gave birth to concept of sustainable forest management that is discussed. This chapter represented a roadmap of how sustainable forest management has been addressed.

This chapter demonstrated how the UN participating countries responded to the Agenda 21 document in developing and implementing their strategies and policies on sustainable forest management. This chapter presented major milestones reached during the development process of criteria and indicators for monitoring sustainable forest management by CIFOR, which ultimately created a foundation for the development of country or regional specific C&Is. The chapter also described the road travelled by South Africa on the development, proclamation and implementation of the policy of sustainable forestry development in South Africa. It described the policy that culminated to the promulgation of the NFA (84 of 1998) and the development of principles, criteria, indicators and standards (PCI&S). The PCI&S were tested and refined in many forests and they were accepted by the CSFM of the National Forestry Advisory Council.

The different methods such as multi-criteria analysis used for identification of appropriate criteria and indicators of sustainable forest management have also been described in detail. This chapter concluded by describing the lessons learnt from other countries which responded to the UNCED call of 1992 to develop policies and strategies to implement sustainable forest management.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter focused on reviewing the evolution and theory associated with the concepts of sustainable development and sustainable forest management concepts. This chapter describes the objectives of evaluating sustainable management of State indigenous forests in the Eastern Cape Province. The research design described in this chapter is based on the qualitative and quantitative audit data collected by independent experts on behalf of the DWAF. This chapter further describes the South African Principles, Criteria, Indicators and Standards (PCI&S) assessment tool which was used to assess the performance of indicators of forest sustainability by these independent experts. It also describes the techniques (e.g. scoring system) used during the audit process. The chapter concludes by describing the process of data analysis using descriptive statistics (e.g. charts, aggregation of data etc.) as the bedrock for the use of integrated composite sustainable development index (analysis tool).

3.2 Objectives of the research

The objectives of this research are to:

- Determine the state of sustainability of the State indigenous forests in the Eastern Cape using the existing audit data collected from eleven forest states extracted from the audit report of 2009.

- Make recommendations to improve the sustainability of State indigenous forests through prioritising the intervention strategies depending on the extent of negative impacts to the sustainability of forests.

3.3 Research design

This study uses quantitative audit data collected by independent experts in 2009. These experts visited the forest estates under study and explained to staff the techniques (e.g. document reviews, observations, informal interviews and scoring system) which they were to use in the audit process of forest estate management. They also described their audit responsibilities and the importance of transparency in providing the information to support the audit project. The forest estate managers had to present their management plans and performance reports.

3.4 Criteria and indicator checklist – assessment tool

It is not possible to assess the state of sustainability of forests without using the appropriate assessment tools. Scotcher and Everard (2001:1) point out that the government of South Africa started the process of developing an assessment tool for monitoring SFM late in 1999. However, the government at the time did not have a pool of experts internally to guide the development process. In recognition of this capacity gap internally, the government appointed externally the Institute of Natural Resources to facilitate the development and testing of criteria, indicators and standards for the management of State forests (commonly known as the PCI&S tool) under the guidance of the National Forestry Advisory Council (an advisory body to the Minister on matters affecting the forestry sector). The development of this tool was concluded in 2002 and thereafter a process of testing was started which concluded in 2004. This process yielded the development of 20 criteria and 54 indicators for both commercial and indigenous forests.

The audit of State indigenous forests in Eastern Cape conducted in 2009 was based on the use of the PCI&S assessment tool which provided adequate information for the appointed independent experts in the audit project to make sound and credible judgements on the current performance on indicators against the desired standards. These independent experts assigned an appropriate performance score to each indicator. The same tool was also offered to other stakeholders in the forestry sector for use on a voluntary basis when assessing the state of sustainability of their

forests. Initially, there was resistance to use of the tool by some forest managers who perceived that this tool was developed to criticise the management of forests rather than improving their sustainability. However, after conducting an awareness raising campaign, the majority of stakeholders changed their perception on the use of the assessment tool.

In this research, only the first 41 indicators are considered for assessing the state of sustainability of State indigenous forests in the Eastern Cape, mainly due to their relevance to this type of forests. In terms of the PCI&S framework these indicators are grouped under environmental, economic and social aspects to make it easy to assess the forest sustainability.

However, this study focuses specifically on the indicators as shown in Appendix 2. In addition to this tool, a Guide for Forest Managers and Auditors to Achieve Sustainable Forest Management was used by the independent experts to complement the tool in assigning performance scores to the indicators. The indicators were grouped under relevant sustainability group (e.g. environmental, social and economic). The elements of the PC&IS management framework according to DWAF (2005) are described in Table 3.1.

Table 3.1 : Description of key concepts of the PCI&S tool

Element	Description
Principles (P)	Are defined as the broad goal statements for achieving sustainable forest management and form the core of the National Forests Act no. 84 of 1998 i.e. Natural forests must not be destroyed.
Criteria (C)	Provide categories around which judgement can be made to assess whether a principle (of sustainable forest management) has been fulfilled i.e. Natural forests are protected.
Indicators (I)	Describe vital aspects of a criterion that can be demonstrated to indicate compliance with sustainable forest management i.e. Implementation of forest protection plans.
Measures (M)	Are means of quantification/qualification, to prove whether or not the indicator has been met i.e. Percentage of forest protection posts on staff establishment plan that have been filled.
Standards (S)	Are minimum levels or objectives set as targets to which management should strive in an attempt to improve sustainability i.e. Numbers of protection personnel match the required number estimated by the forest manager to effectively manage the threats to the forest.
Observation (objective evidence)	This refers to the observation of actual performance against the set standard during the assessment.
Corrective Action Request (CAR)	This refers to description of what needs to be done in order to improve the situation in achieving the set standards i.e. strategy to resolve the constraints and or solutions to the challenges.

The framework of the PCI&S assessment tool is described in detail in Appendix 2. Table 3.2 below shows the relationship between indicator, criterion and sustainability group.

Table 3.2 : Relationship between sustainability group, criterion and indicator

SG	CRITERION	INDICATOR
ENVIRONMENTAL	CRITERION 1: Natural forests are protected	Indicator 1.1: Implementation of natural forest protection plans Indicator 1.2: State of forest protection
	CRITERION 2: Biodiversity of natural forests is conserved	Indicator 2.3: Presence of rare, threatened and endangered species
	CRITERION 3: Natural forest ecosystem structures are conserved and processes maintained	Indicator 3.1: Condition of natural forest margins Indicator 3.2: Condition of natural forest canopy Indicator 3.3: Condition of under storey tree and shrub layer Indicator 3.5: Rehabilitation of degraded natural forest areas
	CRITERION 4: Forests are protected from negative effects of fire, pests and diseases, and alien invader plants	Indicator 4.2: Negative impacts of fire Indicator 4.3: Infestation by alien invader plants
	CRITERION 5: Production potential is maintained or improved	Indicator 5.1: Standing stock assessment Indicator 5.2: Level or rate of resource use Indicator 5.3: Level of multiple resource use from forest ecosystems Indicator 5.4: Identification and development of new alternative forest resources Indicator 5.5: Resource use efficiency
	CRITERION 6: Soil and water resources are conserved	Indicator 6.2: Water quality Indicator 6.3: Soil conservation Indicator 6.4: Riparian zone and wetland management activities Indicator 6.5: Pollution levels
ECONOMICAL	CRITERION 7: Forests make a positive contribution to the economy	Indicator 7.3: Forestry's contribution to the local economy Indicator 7.4: Forestry's contribution to local development
	CRITERION 8: The forest economy is resilient	Indicator 8.2: Staff turnover in forest based business Indicator 8.3: Taxes, levies and charges paid by forestry

Table 3.2 : Relationship between sustainability group, criterion and indicator (Continues…)

SOCIAL	CRITERION 9: People have rights to access and use of forests	Indicator 9.1: Opportunities for forest based activities Indicator 9.2: Rights are understood and respected
	CRITERION 10: Forests are used responsibly	Indicator 10.1: Control and enforcement of access and use
	CRITERION 11: Land tenure of forest areas is clearly defined, recognised and secure	Indicator 10.1: Control and enforcement of access and use
	CRITERION 12: Cultural, ecological, recreational, historical, aesthetic and spiritual sites and services supplied by forests are maintained	Indicator 12.1: Identification and registration of significant sites Indicator 12.2: Level of satisfaction among users of significant sites
	CRITERION 13: The distribution of employment benefits from forests is fair	Indicator 13.1: Employment opportunities associated with forestry Indicator 13.2: Compliance with labour legislation by forest owners, managers and contractors Indicator 13.3: Remuneration of workers
	CRITERION 14: The distribution of the costs from forestry is fair	Indicator 14.1: Negative impacts of forestry activities on people
	CRITERION 15: Crime in forestry areas is minimised	Indicator 15.1: Incidence of crime Indicator 15.2: Cost of security
	CRITERION 16: Forestry contributes to the reduction of HIV/AIDS and its resultant impacts	Indicator 16.1: Absenteeism Indicator 16.2: HIV/AIDS management strategies
	CRITERION 17: There is effective stakeholder participation in forestry management	Indicator 17.1: Effectiveness of participation Indicator 17.2: Implementation of outcomes of participation Indicator 17.3: Capacity to participate Indicator 17.4: Conflict management
	CRITERION 18: Forests are developed and managed so that persons or categories of persons disadvantaged by unfair discrimination are advanced	Indicator 18.1: Creation of forest management opportunities for disadvantaged persons Indicator 18.2: Awareness among previously disadvantaged persons of forest management opportunities

SG = Sustainability Group

3.5 Sampling and data collection

This research is mainly based on the audit data collected during the audit of eleven forest estates responsible for the management of State indigenous forests in 2009. This data was collected by three experienced independent experts who between them have an extensive audit experience of more than 25 years. These audits were conducted during the period from 25 May to 27 August 2009 to solicit expert judgements on the performance of the indicators against the desired sustainability state (standard) of forests. In pursuing the audit project, the experts were provided

with an assessment tool in the form of a set of principles, criteria, indicators and standards framework on which to base their judgements. This assessment tool is a product of a thorough consultative process facilitated by the government which involved the majority of affected stakeholders.

Kumar (2000) points out that it is accepted in the field of research for a researcher to use the available data depending on the willingness of the sources to provide such data. In this study, the Department of Water Affairs and Forestry (DWAF) through the Acting Deputy Director for State indigenous forests in the Eastern Cape gave permission (Appendix 2) to use the available information in the audit report for the research.

In terms of the National Forest Act (No. 84 of 1998), the management of State indigenous forests is a concurrent competence between the provincial and national governments. Therefore the Department of Water Affairs and Forestry started a process to transfer the State indigenous forests from the national government to the provincial government. This process required the auditing of the assets being transferred to the provincial government. In trying to eliminate biasness and subjectivity in the audit process, the DWAF decided to seek the services of external and independent consultants to conduct the audit. In soliciting the external experts, the DWAF drew specific terms of reference to undertake a comprehensive audit of the State indigenous forests in the Eastern Cape with particular focus on 11 forest estates. These indigenous forests comprise a combined area of 109 692 ha, which represents 86% of State indigenous forests in the Eastern Cape as indicated in Table 3.3 below.

Table 3.3 : Description of area (ha) and staff composition (number and %)

Estates	Extent (ha)	Staff filled (No)	Staff Vacant (No)	Total Staff Required (No)	% Vacancies
Keiskammahoek	35000	71	3	74	4%
Ngqeleni	9665	30	25	55	45%
Ngcobo	6586	18	12	30	40%
Gomo	8979	5	90	95	95%
Bulembu	4350	15	36	51	71%
Centane	6954	22	37	59	63%
Afromontane	6778	23	36	59	61%
Bomvane	5029	19	34	53	64%
Port St Johns	6920	32	24	56	43%
Willowvale	9984	16	33	49	67%
Ntsubane	9446	12	83	95	87%
Average/Total	109692	263	413	676	61%

It is important to highlight that the terms of reference also required the independent experts to:

- Conduct field visits into 11 forest estates responsible for management of State indigenous forests.
- Assess the management of these forests in terms of human capital.
- Assess the management of indigenous forests in terms of their environmental, economic and social aspects.
- Advise on the Corrective Action Requests.

These terms of reference were advertised in the newspapers (e.g. Daily Dispatch) to solicit proposals from international and national experts in the forest auditing field. The DWAF received two proposals and one was selected through an internal procurement evaluation process. The members of the appointed consulting firm consisted of three independent experts who had extensive auditing experience in both indigenous and commercial forests which included (but was not limited to) the following:

- Drafting and development of South African Principles, Criteria, Indicators and Standards (SA PCI&S) Manual for Auditors and Managers
- Development of the SA PCIS Framework

- Forestry Stewardship Council (FSC) International Review of Criteria and Indicators (South Africa, Australia, Brazil, Bolivia and Germany)
- FSC National Initiative to develop certification standards for Forestry South Africa.

Table 3.4 below shows the number of people who participated in the audits in 2009 in each of the estates as well as the period in which the audit was conducted. As can be seen in this table, these audits started on 25th May 2009 and ended on 27th August 2009.

Table 3.4 : Number of people participating in the audit project of 2009

Estates	No of Independent experts	No of participated DAFF staff	Total	Dates of Audit
Afromontane	2	2	4	13-14 August 2009
Bomvane	2	9	11	26-27 August 2009
Bulembu	2	5	7	29-30 July 2009
Centane	2	4	6	1-2 June 2009
Gomo	2	6	8	11-12 August 2009
Keiskammahoek	3	8	11	25-26 May 2009
Ngcobo	2	3	5	24-25 August 2009
Ngqeleni	2	10	12	20-21 July 2009
Port St Johns	2	5	7	27-28 July 2009
Willowvale	2	5	7	22-23 July 2009
Ntsubane	2	2	4	3-4 June 2009
TOTAL	23	59	82	

The DAFF staff mainly played an observation role and occasionally provided clarity on the information given to the independent experts. These staff comprised foresters, forestry scientists, forest estate managers, district forest managers and an area forest manager.

Table 3.5 below describes the evaluation steps and techniques followed by independent experts during the audit process. In each forest estate, the audit process started with the inception (opening) meeting where both DAFF and the team of experts explained the process or approach to be followed in the audit and concluded by assigning the performance score in each indicator.

Table 3.5 : Evaluation techniques used by independent experts

Evaluating method		Description
Opening meeting	**:**	introduces the team, explainsthe purpose of the audit, discusses the audit itinerary and what is expected of the DAFF staff. Lead Auditor provides a brief overview of the auditing process including: Auditing responsibilities Approach to scoring The importance of transparency and information sharing Proposed audit agenda Forest Estate manager provides an overview of their management plan, activities and staff.
Document review	**:**	Review of documentation • Discussions with forest managers • Review of plans, registers, documents, maps, statistics etc
Informal Interviews	**:**	The independent experts conduct informal Interviews with relevant DAFF staff • To verify management practices and responses and obtain relevant documentation. • To assess a range of issues pertaining to stakeholders including adequate consultation, access, benefits, participation in Forest Estate management, and sourcing of forest contractors and workers.
Field visits	**:**	Field inspections to verify the effectiveness of management operations and to collate additional supporting information. This includes: • Ascertaining the condition of the indigenous forest and associated ecosystems (grasslands, riparian areas etc) • Verifying that operational activities are in line with procedures and work instructions. • Checking environmental safeguards and health and safety. • Checking infrastructure such as workers villages, workshops, chemical stores, inventories etc
Closing meeting	**:**	Hold closing meeting with Forest Estate & support staff. • Discussion of findings from assessment clarification of constraints • Clarification of potential solutions & resource requirements
Assignment of peformance scores	**:**	The independent experts use the audit information collected to agree and assign appropriate score to each indicator in each forest estate.

The independent experts concluded the assessment by discussing and agreeing on the performance scores to be assigned to indicators based on the collected narrative information. The

audit project did not undertake a comprehensive analysis of audit data nor did they aggregate the data to determine the overall sustainability of indigenous forests in the Eastern Cape. The analysis of data by the independent experts was based on percentages of the performance scores which defined the conformance and non-conformance performance of indicators, without aggregating the performance scores in terms of the ICSD model.

This research was initially planned to use the existing audit data from all 12 forest estates in the Eastern Cape, however it was discovered that the 12th forest estate was assessed in 2008 by a different team of experts. Therefore it was not reasonable to include this estate assessed by a different team of experts, using different judgements, and assessed at a different time.

3.6 Scoring Method

The scoring of indicators using the PCI&S assessment tool was done by a team of independent experts, which yielded performance scores. Table 3.6 below shows the description and symbols that are used in most tables in this study. Therefore it is imperative that the upcoming tables are read together with this table.

Table 3.6 :Description of indicator symbols

Indicator Symbol	Description
I 1.1	Implementation of natural forest protection plans
I 1.2	State of forest protection
I 2.3	Presence of rare, threatened and endangered species
I 3.1	Condition of natural forest margins
I 3.2	Condition of natural forest cover
I 3.3	Condition of understorey tree and shrub layer
I 3.5	Rehabilitation of degraded natural forest areas
I 4.2	Negative impacts of fire
I 4.3	Infestation by alien invader plants
I 5.1	Standing stock assessment
I 5.2	Level or rate of resource use
I 5.3	Level of multiple resource use from forest ecosystems
I 5.4	Identification and development of new alternative forest resources
I 5.5	Resource use efficiency
I 6.2	Water quality
I 6.3	Soil conservation
I 6.4	Riparian zone and wetland management activities
I 6.5	Pollution levels
I 7.3	Forestry's contribution to the local economy
I 7.4	Forestry's contribution to the local development
I 8.2	Staff turnover in forest based activities
I 9.1	Opportunities for forest based activities
I 9.2	Rights are understood and respected
I 10.1	Control and enforcement of access and use
I 11.1	Security of land tenure
I 12.1	Identification and registration of significant sites
I 12.2	Level of satisfaction amongst users of significant sites
I 13.1	Employment opportunities associated with forestry
I 13.2	Compliance with labour legislation by forest owners, managers and contractors
I 13.3	Remuneration of workers
I 14.1	Negative impacts of forestry activities on people
I 15.1	Incidence of crime
I 15.2	Cost of security
I 16.1	Absenteeism
I 16.2	HIV/AIDS management strategies
I 17.1	Effectiveness of participation
I 17.2	Implementation of outcomes of participation
I 17.3	Capacity to participate
I 17.4	Conflict management
I 18.1	Creation of forest management opportunities for disadvantaged persons
I 18.2	Awareness among previously disadvantaged persons of forest management opportunities

In this research, performance scores are normalised as reflected in Table 3.7 to ease the data analysis process and to eliminate anticipated interpretation errors which could be discovered later in research as noted by Nogita (1972:197).

Table 3.7 : Indicator performance scores as adjusted

SG	Indicator Symbol	Units	Keiskammahoek	Ngqeleni	Ngcobo	Gomo	Bulembu	Centane	Afromontane	Bomvane	Port St Johns	Willowvale	Ntsubane
Environmental	I 1.1	Number	1	1	1	0	1	1	1	1	1	1	1
	I 1.2	Number	1	1	1	1	1	1	2	1	1	1	1
	I 2.3	Number	1	0	1	1	1	0	1	0	1	0	0
	I 3.1	Number	1	1	1	1	1	1	1	1	1	1	0
	I 3.2	Number	1	1	1	1	0	1	1	0	1	1	1
	I 3.3	Number	1	1	1	1	1	1	1	1	1	1	1
	I 3.5	Number	1	2	2	1	1	1	1	1	1	1	2
	I 4.2	Number	3	3	3	2	2	1	2	2	2	2	2
	I 4.3	Number	1	2	1	1	1	1	2	1	1	1	1
	I 5.1	Number	2	0	0	0	1	0	0	1	2	0	1
	I 5.2	Number	2	0	0	1	2	1	2	1	1	0	2
	I 5.3	Number	2	2	2	2	2	2	2	2	2	2	2
	I 5.4	Number	2	3	2	2	2	3	1	2	2	2	2
	I 5.5	Number	2	2	3	3	3	3	2	3	2	2	3
	I 6.2	Number	1	2	0	1	1	1	2	0	1	1	0
	I 6.3	Number	1	3	1	2	2	2	2	0	2	1	1
	I 6.4	Number	1	2	1	1	1	1	1	1	1	1	1
	I 6.5	Number	3	3	3	3	3	2	3	1	2	3	1
Economical	I 7.3	Number	2	1	1	1	1	2	1	1	1	2	1
	I 7.4	Number	1	1	1	1	2	1	1	1	1	2	1
	I 8.2	Number	2	1	1	0	0	1	1	1	1	1	0
Social	I 9.1	Number	1	1	1	1	1	1	1	1	1	1	1
	I 9.2	Number	2	2	1	1	2	2	2	1	1	1	2
	I 10.1	Number	2	1	1	1	1	1	2	1	1	1	2
	I 11.1	Number	3	3	2	3	3	3	3	3	1	3	1
	I 12.1	Number	1	1	1	2	2	3	2	1	1	1	2
	I 12.2	Number	1	2	2	2	2	3	2	2	2	1	3
	I 13.1	Number	3	2	3	1	1	0	0	3	3	2	2
	I 13.2	Number	2	2	2	2	2	2	2	2	2	2	2
	I 13.3	Number	3	3	3	3	3	3	3	3	3	3	3
	I 14.1	Number	2	2	3	2	2	2	2	3	3	2	2
	I 15.1	Number	1	2	2	2	2	2	3	3	2	2	2
	I 15.2	Number	2	2	1	0	2	2	2	2	1	2	1
	I 16.1	Number	2	2	2	2	2	2	3	3	3	2	3
	I 16.2	Number	2	2	2	2	3	2	2	2	2	2	3
	I 17.1	Number	1	1	1	2	2	2	2	1	2	2	2
	I 17.2	Number	2	2	1	1	2	2	2	2	2	2	2
	I 17.3	Number	1	2	1	2	2	2	2	1	2	3	2
	I 17.4	Number	2	2	1	1	2	2	1	2	2	2	2
	I 18.1	Number	0	2	2	1	1	2	1	2	1	2	1
	I 18.2	Number	2	2	2	2	2	2	2	2	2	2	2

SG= Sustainability Group

The scoring system used in the audit was based on the scoring system designed by Prabhu *et al.* (1999:44). This scoring system is widely recognised and has been used by various experts worldwide to assess the sustainability of forests (Balana *et al.*, 2010). During the audit process, performance scores were initially assigned by a team of experts to indicators using a five-point scale, which was later normalised by the researcher to a three-point scale (0: non- conformance to the desired standards of forest sustainability, 1: requirements of the desired standards of forest sustainability are largely not met, 2: requirements of the desired standards of forest sustainability are largely met, 3: full conformance to the desired standards of forest sustainability) .

3.7 Data analysis

The analysis of data is focused on both qualitative and quantitative data collected from the audit report of 2009. In this research, descriptive statistics are applied to provide a better understanding of the data. This analysis involves the aggregation of performance scores from the indicator level to the sustainability group level using the integrated composite sustainable development (ICSD) index (Krajnc and Glavic, 2005:189).

This analysis begins by calculating the relative weight of each indicator under each sustainability group (e.g. environmental, economic and social). This relative weight is described as the weight of each indicator in relation to the weights of other indicators falling under a particular sustainability group. This is further explained using Equation 3.1 below, where W_{ij} represents the relative weight of indicator ***i*** under sustainability group ***j*** and ***n*** represents the number of indicators in sustainability group ***j***.

$$W_{ij} = \frac{1}{n_j} \qquad (3.1)$$

This is followed by calculating the weighted performance score of an indicator, which is described as the product of the relative weight and performance score of the same indicator. This weighted performance score is further explained in the Equation 3.2 below, where $\boldsymbol{S_{W(ij)}}$ represents the weighted performance score of indicator ***i*** under sustainability group ***j***, W_{ij} represents the relative weight of indicator ***i*** under sustainability group ***j*** and S_{ij} represents adjusted performance score of indicator ***i*** under sustainability group ***j*** that was assigned by the independent experts based on their expert judgements.

$$\boldsymbol{S_{W(ij)}} = W_{ij} \text{ x } S_{ij} \qquad (3.2)$$

The calculation of weighted performance scores of indicators is followed by calculating the aggregated weighted performance score of a sustainability group (e.g. environmental, economic and social). Thus, the aggregated weighted performance score of a sustainability group is defined as the sum of the weighted performance scores belonging to a particular sustainability group. This can simply be explained using Equation 3.3 below, where S_{wj} represents the aggregated weighted performance score of ***j*** sustainability group and $\boldsymbol{S_{W(ij}}$ represents the weighted performance scores of indicators ***i*** under sustainability group ***j***.

$$S_{wj} = \sum S_{w(ij)} \qquad (3.3)$$

This is followed by calculating the integrated composite sustainable development performance score which is defined as the average of aggregated weighted performance scores of sustainability groups. This is further explained in Equation 3.4 below, where $S_{CSD,k}$ represents the integrated composite sustainable development performance score of *k* forest estate, $\boldsymbol{S_{Wij}}$ represents the weighted performance scores of indicators ***i*** under sustainability group ***j*** and N_j represents the number of sustainability groups ***j***.

$$S_{CSD,k} = \frac{\sum_{j=1} S_{wj}}{N_j} \qquad (3.4)$$

Finally, the overall integrated composite sustainable development performance score for Eastern Cape State indigenous forests is calculated using Equation 3.5 below, where $S_{CSD,O}$ represents the overall integrated composite sustainable development performance score, $S_{CSD,k}$ represents the integrated composite sustainable development performance score of *k* forest estate and N_k represents the number of forest estates ***k.***

$$S_{CSD,O} = \frac{\sum_{j=1} S_{CSD,K}}{N_k} \qquad (3.5)$$

The ICSD performance scores are presented in tabular form to illustrate the variation of performance in different forest estates.

This research also attempted to determine the number of posts required per hectare, however it is noted that the development of establishment or structure is not solely depended on the size (ha) of forests, but depends on a number of factors such as the proximity between the forest patches, economies of scale etc.

3.8 Ethical issues

The research was done using the existing audit data within the DWAF and permission to conduct this research was granted by the Acting Deputy Director: Indigenous Forest Management-Eastern Cape (see Appendix 2). As indicated in Section 3.5 the independent experts have extensive experience in the auditing field and therefore their integrity and honesty on matters of confidentiality is not doubted. In every inception (opening) meeting, the independent experts emphasised the importance of transparency and information sharing to encourage free talking and unearthing of information required for objective judgements. The decision on the scoring of

each indicator was informed by information gathered from multiple methods (e.g. document reviews, informal interviews, discussions, observations, field visits etc.) and this alone has reduced the possibility of subjectivity and bias on the part of the independent experts. Furthermore the assignment of performance scores for each indicator was based on a series of discussions between three independent experts before a final score was awarded without the involvement of the managers of the forests concerned and this eliminated bias or fear of the managers. According to the audit report, it was explained to the affected officials that the research will not in any way offend anyone, rather it would provide solutions to the prevailing challenges affecting the management of indigenous forests. Prior to the commencement of this research the forest managers were assured that the recommendations would be presented to them for their consideration and it was evident from their openness and commitment in improving the management of indigenous forests that they accepted this. Integrity, confidentiality and professionalism were maintained throughout the research process by not disclosing the names of participating officials with their views in the audit report, and the organisation's reputation was not damaged (e.g. matters were kept internal and not discussed with outsiders) and the reputation of the officials who participated in the audit project.

3.9 Summary

This chapter has described the method used to conduct this study, including sampling techniques, which guided the selection of research participants in the eleven forest estates in the Eastern Cape province. These forest estates were selected because they were not part of the previous audit conducted in 2008. The PCI&S assessment tool was defined as the framework to be used by the independent experts while assessing the state or condition of each indicator. This chapter also described various techniques used during the collection of audit data (e.g. opening meetings, document review, informal interviews, observations, scoring system etc.) by the independent experts. It also described the steps to be undertaken during data analysis following the framework of an integrated composite sustainable development index model which has been

adopted as the analysis tool in this research. Ethical considerations with special emphasis on the permission granted to conduct this research, credibility of the independent experts, and free participation of research participants were highlighted. The importance of openness, integrity and professionalism not to dent the reputation of the DWAF, stakeholders and the independent experts were emphasised. The next chapter will describe the results obtained through the data analysis.

CHAPTER 4: RESULTS

4.1 Introduction

The aim of this chapter is to present the findings of the study in relation to the research question: "*What is the state of sustainability of State indigenous forests in the Eastern Cape*?" In line with this objective, the chapter will firstly present the findings of data analysis focusing on overall sustainability of State indigenous forests at provincial level through aggregation of findings from eleven forest estates under this study. It also presents the findings of environmental, economic, and social sustainability groups individually and combined for all eleven forest estates. Secondly, the chapter will focus on presenting the results on sustainability of each State indigenous forests included in this study. Finally, the chapter concludes by presenting the summary of the major findings.

4.2 Overall sustainability

Table 4.1 :Composite Sustainable Development performance scores

Indices Symbol	Keiskammahoek	Ngqeleni	Ngcobo	Gomo	Bulembu	Centane	Afromontane	Bomvane	Port St Johns	Willowvale	Ntsubane	Average
Environmental	2	2	1	1	1	1	2	1	1	1	1	1
Economical	2	1	1	1	1	1	1	1	1	2	1	1
Social	2	2	2	2	2	2	2	2	2	2	2	2
CSD	2	2	1	1	1	2	1	1	1	2	1	1

Table 4.1 firstly presents the weighted performance scores of three sustainability groups (e.g. environmental, economic and social) in each forest estate. These weighted performance scores were calculated using Equation 3.3 in Chapter 3, which is described as the sum of weighted indicator performance scores under a particular sustainability group. At the bottom, the table

presents the composite sustainable development scores of all eleven forest estates. These results are interpreted below.

Environmental sustainability

In Table 4.1 above, 3 out of 11 forest estates, namely Keiskammahoek, Ngqeleni and Afromontane, forest estates, were given a score of "2" in respect of environmental sustainability. This means that these forest estates are largely meeting the requirements of the desired standards of forest sustainability in respect to sustaining the environment. However, the remaining forest estates as listed in Table 4.1were given a score of "1". Thus, these forest estates largely do not meet the requirements of the desired environmental standards of forest sustainability. The environmental sustainability group was given an overall (composite) score of "1", which indicates that it largely does not meet the requirements of the desired standards to ensure forest sustainability.

Economic sustainability

In terms of economic sustainability, Table 4.1 shows that 2 out of 11 forest estates, Keiskammahoek and Willowvale, were given a score of "2". These forest estates are largely meeting the requirements of the desired economic standards of forest sustainability. However, the remaining forest estates as listed in Table 4.1 were given a score of "1". These are forest estates which largely did not meet the requirements of the desired economic standards of forest sustainability. Overall, economic sustainability was given a (composite) score of "1", which indicates lack of sustainability as these forests largely failed to meet the desired economic standards of forest sustainability.

Social sustainability

In Table 4.1 above, all the forest estates, namely Keiskammahoek, Ngqeleni, Gomo, Bulembu, Centane, Afromontane, Ngcobo, Bomvane, Port St Johns, Willowvale, and Ntsubane forest estates were given a score of "2" for social sustainability. Thus, all these forest estates are largely meeting the requirements of the desired social standards of forest sustainability. The next section presents composite sustainable development for all the forest estates in this study.

Composite Sustainable development for all eleven forest estates

In addition to indication of sustainability decomposed in terms of economic, environmental, and social, Table 4.1 also shows the composite sustainable development of each forest estate. The table shows that 4 out of 11 forest estates, Keiskammahoek, Ngqeleni, Centane and Willowvale, were given an overall (composite) score of "2". Thus, these forest estates are largely meeting the requirements of the desired overall standards of forest sustainability. Keiskammahoek forest estate is the only forest estate which was awarded a score of "2" in all 3 sustainability groups and thus this forest estate is considered the most sustainable compared to other forest estates.

However, the remaining 7 forest estates as shown in Table 4.1 above were given a score of "1", which indicates that these forest estates largely do not meet the requirements of the desired standards of forest sustainability.

The composite sustainable development score for all eleven forest estates was "1" which indicates the State indigenous forests in the Eastern Cape Province largely do not meet the requirements of the desired standards of forest sustainability. In response to the question about the state of sustainability of these forests, these results show that all State indigenous forests in Eastern Cape are not being managed in a sustainable manner.

4.3 Sustainability of individual forest estates

The following sections present the results (e.g. weighted performance scores and composite sustainable development (CSD) scores) on state of sustainability regarding all the 11 forest estates on three aspects, namely, the economic indicators, social indicators and environmental indicators. This indicates how the independent experts scored specific indicators which eventually reflect the social, economic and environmental dimensions of sustainable forest management. The scores of these indicators were adjusted by the researcher to allow easy analysis of data. In the following sections the results are presented with specific focus on the lowest and highest indicator scores.

4.3.1 Keiskammahoek forest estate

Table 4.2 : Keiskammahoek Forest Estate

SG	IS	Indicator Description	PS	WPS
ENV	I 1.1	Implementation of natural forest protection plans	1	0.056
	I 1.2	State of forest protection	1	0.056
	I 2.3	Presence of rare, threatened and endangered species	1	0.056
	I 3.1	Condition of natural forest margins	1	0.056
	I 3.2	Condition of natural forest cover	1	0.056
	I 3.3	Condition of understorey tree and shrub layer	1	0.056
	I 3.5	Rehabilitation of degraded natural forest areas	1	0.056
	I 4.2	Negative impacts of fire	3	0.167
	I 4.3	Infestation by alien invader plants	1	0.056
	I 5.1	Standing stock assessment	2	0.111
	I 5.2	Level or rate of resource use	2	0.111
	I 5.3	Level of multiple resource use from forest ecosystems	2	0.111
	I 5.4	Identification and development of new alternative forest resources	2	0.111
	I 5.5	Resource use efficiency	2	0.111
	I 6.2	Water quality	1	0.056
	I 6.3	Soil conservation	1	0.056
	I 6.4	Riparian zone and wetland management activities	1	0.056
	I 6.5	Pollution levels	3	0.167
TOTAL			27	2
ECO	I 7.3	Forestry's contribution to the local economy	2	0.667
	I 7.4	Forestry's contribution to the local development	1	0.333
	I 8.2	Staff turnover in forest based activities	2	0.667
TOTAL			5	2
SOCIAL	I 9.1	Opportunities for forest based activities	1	0.050
	I 9.2	Rights are understood and respected	2	0.100
	I 10.1	Control and enforcement of access and use	2	0.100
	I 11.1	Security of land tenure	3	0.150
	I 12.1	Identification and registration of significant sites	1	0.050
	I 12.2	Level of satisfaction amongst users of significant sites	1	0.050
	I 13.1	Employment opportunities associated with forestry	3	0.150
	I 13.2	Compliance with labour legislation by forest owners, managers and contractors	2	0.100
	I 13.3	Remuneration of workers	3	0.150
	I 14.1	Negative impacts of forestry activities on people	2	0.100
	I 15.1	Incidence of crime	1	0.050
	I 15.2	Cost of security	2	0.100
	I 16.1	Absenteeism	2	0.100
	I 16.2	HIV/AIDS management strategies	2	0.100
	I 17.1	Effectiveness of participation	1	0.050
	I 17.2	Implementation of outcomes of participation	2	0.100
	I 17.3	Capacity to participate	1	0.050
	I 17.4	Conflict management	2	0.100
	I 18.1	Creation of forest management opportunities for disadvantaged persons	0	0.000
	I 18.2	Awareness among previously disadvantaged persons of forest management opportunities	2	0.100
TOTAL			35	2
CSD Score				2

LEGEND : SG: Sustainability Group ECO: Economic IS: Indicator Symbol
PS: Performance Score WPS: Weighted Performance Score

In Table 4.2, the composite sustainable development (CSD) score of "2" indicates that the forest estate largely meets the requirements of the requirements of the desired standards of forest sustainability. All three sustainability groups or aspects (environmental, economic and social) were assigned a score of "2"which indicates that this forest estate largely meets the requirements of the desired standards of forest sustainability. Findings on each of the three aspects of the composite sustainable development are presented below to reflect the scores.

Environmental Indicators

Table 4.2 shows that 11 out of 18 environmental indicators were assigned a score of "1" which is the lowest score assigned in this sustainability group. These indicators are implementation of natural forest protection plans, state of forest protection, presence of rare, threatened and endangered species, condition of natural forest margins, condition of natural forest canopy, condition of under storey and shrub layer, rehabilitation of degraded natural forests, infestation by alien invader plants, water quality, soil conservation, and riparian zone and wetland management activities. Thus, these indicators largely do not meet the requirements of the desired standards of forest sustainability.

However, 2 out of 18 indicators – negative impacts of fire and pollution levels – were assigned a score of "3" which is the highest score in this sustainability group. This is a sign that the estate is not experiencing any fire problems and the surrounding environment is free from the pollutants. Thus, these indicators conform fully to the desired standards of forest sustainability.

Economic indicators

Table 4.2 shows that 2 out of 3 economic indicators – forestry contribution to the local economy and staff turnover in forest based activities – were assigned a score of "2", which is the highest score in this sustainability group. Consequently, these indicators largely meet the requirements of the desired standards of forest sustainability.

However, 1 out of 3 economic indicators – the forestry contribution to the local development – was assigned a score of“1” which is the lowest score in this sustainability group. This indicator largely does not meet the requirements of the desired standards of forest sustainability.

Social indicators

Table 4.2 shows that 3 out of 20 social indicators were assigned a score of “3” which is the highest score in this sustainability group. These indicators are security of land tenure, employment opportunities associated with forestry and remuneration of workers. These indicators conform fully to the requirements of the desired standards of forest sustainability.

However, only 1 out of 20 social indicators – the creation of forest management opportunities for disadvantaged persons – was assigned a score of “0” which is the lowest score in this sustainability group. Thus, this indicator is not conforming to requirements of the desired standards of forest sustainability.

4.3.2 Ngqeleni forest estate

Table 4.3 : Ngqeleni Forest Estate

SG	IS	Indicator Description	PS	WPS
ENV	I 1.1	Implementation of natural forest protection plans	1	0.056
	I 1.2	State of forest protection	1	0.056
	I 2.3	Presence of rare, threatened and endangered species	0	0.000
	I 3.1	Condition of natural forest margins	1	0.056
	I 3.2	Condition of natural forest cover	1	0.056
	I 3.3	Condition of understorey tree and shrub layer	1	0.056
	I 3.5	Rehabilitation of degraded natural forest areas	2	0.111
	I 4.2	Negative impacts of fire	3	0.167
	I 4.3	Infestation by alien invader plants	2	0.111
	I 5.1	Standing stock assessment	0	0.000
	I 5.2	Level or rate of resource use	0	0.000
	I 5.3	Level of multiple resource use from forest ecosystems	2	0.111
	I 5.4	Identification and development of new alternative forest resources	3	0.167
	I 5.5	Resource use efficiency	2	0.111
	I 6.2	Water quality	2	0.111
	I 6.3	Soil conservation	3	0.167
	I 6.4	Riparian zone and wetland management activities	2	0.111
	I 6.5	Pollution levels	3	0.167
TOTAL			29	2
ECO	I 7.3	Forestry's contribution to the local economy	1	0.333
	I 7.4	Forestry's contribution to the local development	1	0.333
	I 8.2	Staff turnover in forest based activities	1	0.333
TOTAL			3	1
SOCIAL	I 9.1	Opportunities for forest based activities	1	0.050
	I 9.2	Rights are understood and respected	2	0.100
	I 10.1	Control and enforcement of access and use	1	0.050
	I 11.1	Security of land tenure	3	0.150
	I 12.1	Identification and registration of significant sites	1	0.050
	I 12.2	Level of satisfaction amongst users of significant sites	2	0.100
	I 13.1	Employment opportunities associated with forestry	2	0.100
	I 13.2	Compliance with labour legislation by forest owners, managers and contractors	2	0.100
	I 13.3	Remuneration of workers	3	0.150
	I 14.1	Negative impacts of forestry activities on people	2	0.100
	I 15.1	Incidence of crime	2	0.100
	I 15.2	Cost of security	2	0.100
	I 16.1	Absenteeism	2	0.100
	I 16.2	HIV/AIDS management strategies	2	0.100
	I 17.1	Effectiveness of participation	1	0.050
	I 17.2	Implementation of outcomes of participation	2	0.100
	I 17.3	Capacity to participate	2	0.100
	I 17.4	Conflict management	2	0.100
	I 18.1	Creation of forest management opportunities for disadvantaged persons	2	0.100
	I 18.2	Awareness among previously disadvantaged persons of forest management opportunities	2	0.100
TOTAL			38	2
CSD Score				2

LEGEND : SG: Sustainability Group ECO: Economic IS: Indicator Symbol
PS: Performance Score WPS: Weighted Performance Score

In Table 4.3, the CSD score of “2” indicates that this forest estate largely meets the requirements of the desired standards of forest sustainability. Two sustainability groups (environmental and social) were assigned a weighted performance score of “2” which reflects that the performance of this forest estate largely meets the requirements of the desired standards of forest sustainability. However, the economic sustainability group was assigned a weighted performance score of “1” .On this particular aspect, this forest estate largely does not meet the requirements of the desired standards of forest sustainability. The following is the presentation of scores on the three specific aspects of the composite sustainable development.

Environmental indicators

The indicators of environmental sustainability include presence of rare, threatened and endangered species, standing stock assessment, and level or rate of resource use. Table 4.3 shows that these 3 out of the 18 environmental indicators were assigned a score of “0” which is the lowest score assigned in this sustainability group. Thus, this forest estate does not conform to the desired standards of forest sustainability.

However, 4 out of 18 indicators were assigned a score of “3” which is the highest score in this sustainability group. These indicators are negative impacts of fire, identification and development of new alternative forest resources, soil conservation, and pollution levels. Thus, these indicators conform fully to the requirements of the desired standards of forest sustainability.

Economic indicators

Table 4.3 shows that all 3 economic indicators – forestry contribution to the local economy, forestry contribution to the local development and staff turnover in forest based activities – were assigned a score of "1". These indicators largely do not meet the requirements of the desired standards of forest sustainability.

Social indicators

Table 4.3 shows that 2 out of 20 social indicators were assigned a score of "3" which is the highest score in this sustainability group. These indicators are security of land tenure and remuneration of workers. Thus, these indicators conform fully to the requirements of the desired standards of forest sustainability.

However, 4 out of 20 social indicators – opportunities for forest based activities, control and enforcement of access and use, identification and registration of significant sites, and effectiveness of participation – were assigned a score of "1" which is the lowest score in this sustainability group. Thus, these indicators largely do not meet the requirements of the desired standards of forest sustainability.

4.3.3 Ngcobo forest estate

Table 4.4 : Ngcobo Forest Estate

SG	IS	Indicator Description	PS	WPS
ENV	I 1.1	Implementation of natural forest protection plans	1	0.056
	I 1.2	State of forest protection	1	0.056
	I 2.3	Presence of rare, threatened and endangered species	1	0.056
	I 3.1	Condition of natural forest margins	1	0.056
	I 3.2	Condition of natural forest cover	1	0.056
	I 3.3	Condition of understorey tree and shrub layer	1	0.056
	I 3.5	Rehabilitation of degraded natural forest areas	2	0.111
	I 4.2	Negative impacts of fire	3	0.167
	I 4.3	Infestation by alien invader plants	1	0.056
	I 5.1	Standing stock assessment	0	0.000
	I 5.2	Level or rate of resource use	0	0.000
	I 5.3	Level of multiple resource use from forest ecosystems	2	0.111
	I 5.4	Identification and development of new alternative forest resources	2	0.111
	I 5.5	Resource use efficiency	3	0.167
	I 6.2	Water quality	0	0.000
	I 6.3	Soil conservation	1	0.056
	I 6.4	Riparian zone and wetland management activities	1	0.056
	I 6.5	Pollution levels	3	0.167
TOTAL			24	1
ECO	I 7.3	Forestry's contribution to the local economy	1	0.333
	I 7.4	Forestry's contribution to the local development	1	0.333
	I 8.2	Staff turnover in forest based activities	1	0.333
TOTAL			3	1
SOCIAL	I 9.1	Opportunities for forest based activities	1	0.050
	I 9.2	Rights are understood and respected	1	0.050
	I 10.1	Control and enforcement of access and use	1	0.050
	I 11.1	Security of land tenure	2	0.100
	I 12.1	Identification and registration of significant sites	1	0.050
	I 12.2	Level of satisfaction amongst users of significant sites	2	0.100
	I 13.1	Employment opportunities associated with forestry	3	0.150
	I 13.2	Compliance with labour legislation by forest owners, managers and contractors	2	0.100
	I 13.3	Remuneration of workers	3	0.150
	I 14.1	Negative impacts of forestry activities on people	3	0.150
	I 15.1	Incidence of crime	2	0.100
	I 15.2	Cost of security	1	0.050
	I 16.1	Absenteeism	2	0.100
	I 16.2	HIV/AIDS management strategies	2	0.100
	I 17.1	Effectiveness of participation	1	0.050
	I 17.2	Implementation of outcomes of participation	1	0.050
	I 17.3	Capacity to participate	1	0.050
	I 17.4	Conflict management	1	0.050
	I 18.1	Creation of forest management opportunities for disadvantaged persons	2	0.100
	I 18.2	Awareness among previously disadvantaged persons of forest management opportunities	2	0.100
TOTAL			34	2
CSD Score				1

LEGEND : SG: Sustainability Group ECO: Economic IS: Indicator Symbol
PS: Performance Score WPS: Weighted Performance Score

In Table 4.4, the CSD score of "1" indicates that the forest estate largely does not meet the requirements of the desired standards of forest sustainability. Two sustainability groups (e.g. environmental and economic) were assigned a weighted performance score of "1" which indicates that this forest largely does not meet these requirements of the desired standards of forest sustainability. However, the social sustainability group was assigned a weighted performance score of "2" which indicates that this forest estate largely meets the requirements of the desired standards of forest sustainability. The next section presents findings on each group or aspect comprising composite sustainable development.

Environmental indicators

Table 4.4 shows that 3 out of 18 environmental indicators were assigned a score of "0" which is the lowest score assigned in this sustainability group. These indicators are water quality, standing stock assessment, and level or rate of resource use. Thus, these indicators are not conforming to the desired standards of forest sustainability.

However, 3 out of 18 indicators were assigned a score of "3" which is the highest score in this sustainability group. These indicators are negative impacts of fire, resource use efficiency and pollution levels. Thus, these indicators of this forest conform fully to the desired standards of forest sustainability.

Economic indicators

Table 4.4 shows that all 3 economic indicators – forestry contribution to the local economy, forestry contribution to the local development and staff turnover in forest based activities – were assigned a score of "1". These indicators largely do not meet the requirements of desired standards of forest sustainability.

Social indicators

Table 4.4 shows that 3 out of 20 social indicators were assigned a score of “3” which is the highest score in this sustainability group. These indicators are employment opportunities associated with forestry, remuneration of workers and negative impacts of forestry activities on people. Thus, these indicators conform fully to requirements of the desired standards of forest sustainability.

However, 9 out of 20 social indicators were assigned a score of “1” which is the lowest score in this sustainability group. These indicators are opportunities for forest based activities, rights are understood and respected, control and enforcement of access and use, identification and registration of significant sites, cost of security, effectiveness of participation, implementation of outcomes of participation, capacity to participate, and conflict management. Thus, these indicators largely do not meet the requirements of the desired standards of forest sustainability.

4.3.4 Gomo forest estate

Table 4.5 : Gomo Forest Estate

SG	IS	Indicator Description	PS	WPS
ENV	I 1.1	Implementation of natural forest protection plans	0	0.000
	I 1.2	State of forest protection	1	0.056
	I 2.3	Presence of rare, threatened and endangered species	1	0.056
	I 3.1	Condition of natural forest margins	1	0.056
	I 3.2	Condition of natural forest cover	1	0.056
	I 3.3	Condition of understorey tree and shrub layer	1	0.056
	I 3.5	Rehabilitation of degraded natural forest areas	1	0.056
	I 4.2	Negative impacts of fire	2	0.111
	I 4.3	Infestation by alien invader plants	1	0.056
	I 5.1	Standing stock assessment	0	0.000
	I 5.2	Level or rate of resource use	1	0.056
	I 5.3	Level of multiple resource use from forest ecosystems	2	0.111
	I 5.4	Identification and development of new alternative forest resources	2	0.111
	I 5.5	Resource use efficiency	3	0.167
	I 6.2	Water quality	1	0.056
	I 6.3	Soil conservation	2	0.111
	I 6.4	Riparian zone and wetland management activities	1	0.056
	I 6.5	Pollution levels	3	0.167
TOTAL			24	1
ECO	I 7.3	Forestry's contribution to the local economy	1	0.333
	I 7.4	Forestry's contribution to the local development	1	0.333
	I 8.2	Staff turnover in forest based activities	0	0.000
TOTAL			2	1
SOCIAL	I 9.1	Opportunities for forest based activities	1	0.050
	I 9.2	Rights are understood and respected	1	0.050
	I 10.1	Control and enforcement of access and use	1	0.050
	I 11.1	Security of land tenure	3	0.150
	I 12.1	Identification and registration of significant sites	2	0.100
	I 12.2	Level of satisfaction amongst users of significant sites	2	0.100
	I 13.1	Employment opportunities associated with forestry	1	0.050
	I 13.2	Compliance with labour legislation by forest owners, managers and contractors	2	0.100
	I 13.3	Remuneration of workers	3	0.150
	I 14.1	Negative impacts of forestry activities on people	2	0.100
	I 15.1	Incidence of crime	2	0.100
	I 15.2	Cost of security	0	0.000
	I 16.1	Absenteeism	2	0.100
	I 16.2	HIV/AIDS management strategies	2	0.100
	I 17.1	Effectiveness of participation	2	0.100
	I 17.2	Implementation of outcomes of participation	1	0.050
	I 17.3	Capacity to participate	2	0.100
	I 17.4	Conflict management	1	0.050
	I 18.1	Creation of forest management opportunities for disadvantaged persons	1	0.050
	I 18.2	Awareness among previously disadvantaged persons of forest management opportunities	2	0.100
TOTAL			33	2
CSD Score				1

LEGEND : SG: Sustainability Group ECO: Economic IS: Indicator Symbol
PS: Performance Score WPS: Weighted Performance Score

In Table 4.5, the CSD score of "1" indicates that the forest estate largely does not meet the requirements of the desired standards of forest sustainability. Two sustainability groups (environmental and economic) were assigned a weighted performance score of "1" which indicates that this forest estate largely does not meet the requirements of the desired standards of forest sustainability. However, the social sustainability group was assigned a weighted performance score of "2". In this regard, this forest estate largely meets the requirements of the desired social standards of forest sustainability. Each aspect comprising composite sustainable development is presented below.

Environmental indicators

Table 4.5 shows that 2 out of 18 environmental indicators were assigned a score of "0" which is the lowest score assigned in this sustainability group. These indicators are implementation of natural forest protection plans and standing stock assessment. Thus, these indicators are not conforming to the desired standards of forest sustainability.

However, 2 out of 18 indicators were assigned a score of "3" which is the highest score in this sustainability group. These indicators are resource use efficiency and pollution levels. Thus, these indicators conform fully to the desired standards of forest sustainability.

Economic indicators

Table 4.5 shows that 2 out of 3 economic indicators – forestry contribution to the local economy and forestry contribution to the local development – were assigned a score of "1", which is the highest score in this sustainability group. These indicators largely do not meet the requirements of the desired standards of forest sustainability.

However, 1 out of 3 economic indicators – staff turnover in forest based activities – was assigned a score of "0" which is the lowest score in this sustainability group. This indicator is not meeting the requirements of the desired standards of forest sustainability.

Social indicators

Table 4.5 shows that 2 out of 20 social indicators were assigned a score of "3" which is the highest score in this sustainability group. These indicators – security of land tenure and remuneration of workers – conform fully to the requirements of the desired standards of forest sustainability.

However, 1 out of 20 social indicators – the cost of security – was assigned a score of "0" which is the lowest score in this sustainability group. Thus, this indicator is not conforming to the requirements of the desired standards of forest sustainability.

4.3.5 Bulembu forest estate

Table 4.6 : Bulembu Forest Estate

SG	IS	Indicator Description	PS	WPS
ENV	I 1.1	Implementation of natural forest protection plans	1	0.056
	I 1.2	State of forest protection	1	0.056
	I 2.3	Presence of rare, threatened and endangered species	1	0.056
	I 3.1	Condition of natural forest margins	1	0.056
	I 3.2	Condition of natural forest cover	0	0.000
	I 3.3	Condition of understorey tree and shrub layer	1	0.056
	I 3.5	Rehabilitation of degraded natural forest areas	1	0.056
	I 4.2	Negative impacts of fire	2	0.111
	I 4.3	Infestation by alien invader plants	1	0.056
	I 5.1	Standing stock assessment	1	0.056
	I 5.2	Level or rate of resource use	2	0.111
	I 5.3	Level of multiple resource use from forest ecosystems	2	0.111
	I 5.4	Identification and development of new alternative forest resources	2	0.111
	I 5.5	Resource use efficiency	3	0.167
	I 6.2	Water quality	1	0.056
	I 6.3	Soil conservation	2	0.111
	I 6.4	Riparian zone and wetland management activities	1	0.056
	I 6.5	Pollution levels	3	0.167
TOTAL			26	1
ECO	I 7.3	Forestry's contribution to the local economy	1	0.333
	I 7.4	Forestry's contribution to the local development	2	0.667
	I 8.2	Staff turnover in forest based activities	0	0.000
TOTAL			3	1
SOCIAL	I 9.1	Opportunities for forest based activities	1	0.050
	I 9.2	Rights are understood and respected	2	0.100
	I 10.1	Control and enforcement of access and use	1	0.050
	I 11.1	Security of land tenure	3	0.150
	I 12.1	Identification and registration of significant sites	2	0.100
	I 12.2	Level of satisfaction amongst users of significant sites	2	0.100
	I 13.1	Employment opportunities associated with forestry	1	0.050
	I 13.2	Compliance with labour legislation by forest owners, managers and contractors	2	0.100
	I 13.3	Remuneration of workers	3	0.150
	I 14.1	Negative impacts of forestry activities on people	2	0.100
	I 15.1	Incidence of crime	2	0.100
	I 15.2	Cost of security	2	0.100
	I 16.1	Absenteeism	2	0.100
	I 16.2	HIV/AIDS management strategies	3	0.150
	I 17.1	Effectiveness of participation	2	0.100
	I 17.2	Implementation of outcomes of participation	2	0.100
	I 17.3	Capacity to participate	2	0.100
	I 17.4	Conflict management	2	0.100
	I 18.1	Creation of forest management opportunities for disadvantaged persons	1	0.050
	I 18.2	Awareness among previously disadvantaged persons of forest management opportunities	2	0.100
TOTAL			39	2
CSD Score				1

LEGEND : SG: Sustainability Group ECO: Economic IS: Indicator Symbol
PS: Performance Score WPS: Weighted Performance Score

In Table 4.6, the CSD score of "1" indicates that the forest estate largely does not meet the requirements of the desired standards of forest sustainability. Two sustainability groups (environmental and economic) were assigned a weighted performance score of "1". As such, this forest estate largely does not meet the requirements of the desired standards of forest sustainability. However, the social sustainability group of standards on forest sustainability was assigned a weighted performance score of "2". This indicates failure of this forest estate to largely meet the requirements of the desired standards of forest sustainability. To put composite sustainable development of this forest estate in perspective, findings on each of the three aspects are presented below.

Environmental indicators

Table 4.6 shows that 1 out of 18 environmental indicators – the condition of natural forest cover – was assigned a score of "0" which is the lowest score assigned in this sustainability group. Thus, this indicator is not conforming to the desired standards of forest sustainability.

However, 2 out of 18 indicators were assigned a score of "3" which is the highest score in this sustainability group. These indicators are resource use efficiency and pollution levels. Thus, these indicators conform fully to the desired standards of forest sustainability.

Economic indicators

Table 4.6 shows that 1 out of 3 economic indicators – forestry contribution to the local development – was assigned a score of "2", which is the highest score in this sustainability group. This indicator largely meets the requirements of the desired standards of forest sustainability.

However, 1 out of 3 economic indicators – staff turnover in forest based activities – was assigned a score of "1" which is the lowest score in this sustainability group. This indicator largely does not meet the requirements of the desired standards of forest sustainability.

Social indicators

Table 4.6 shows that 3 out of 20 social indicators were assigned a score of "3" which is the highest score in this sustainability group. These indicators are security of land tenure, remuneration of workers and HIV/AIDS management strategies. Thus, these indicators conform fully to the requirements of the desired standards of forest sustainability.

However, 4 of 20 social indicators – opportunities for forest based activities, control and enforcement of access and use, employment opportunities associated with forestry and creation of forest management opportunities for disadvantaged persons – were assigned a score of "1" which is the lowest score in this sustainability group. Thus, these indicators largely do not meet the requirements of the desired standards of forest sustainability.

4.3.6 Centane forest estate

Table 4.7 : Centane Forest Estate

SG	IS	Indicator Description	PS	WPS
ENV	I 1.1	Implementation of natural forest protection plans	1	0.056
	I 1.2	State of forest protection	1	0.056
	I 2.3	Presence of rare, threatened and endangered species	0	0.000
	I 3.1	Condition of natural forest margins	1	0.056
	I 3.2	Condition of natural forest cover	1	0.056
	I 3.3	Condition of understorey tree and shrub layer	1	0.056
	I 3.5	Rehabilitation of degraded natural forest areas	1	0.056
	I 4.2	Negative impacts of fire	1	0.056
	I 4.3	Infestation by alien invader plants	1	0.056
	I 5.1	Standing stock assessment	0	0.000
	I 5.2	Level or rate of resource use	1	0.056
	I 5.3	Level of multiple resource use from forest ecosystems	2	0.111
	I 5.4	Identification and development of new alternative forest resources	3	0.167
	I 5.5	Resource use efficiency	3	0.167
	I 6.2	Water quality	1	0.056
	I 6.3	Soil conservation	2	0.111
	I 6.4	Riparian zone and wetland management activities	1	0.056
	I 6.5	Pollution levels	2	0.111
TOTAL			23	1
ECO	I 7.3	Forestry's contribution to the local economy	2	0.667
	I 7.4	Forestry's contribution to the local development	1	0.333
	I 8.2	Staff turnover in forest based activities	1	0.333
TOTAL			4	1
SOCIAL	I 9.1	Opportunities for forest based activities	1	0.050
	I 9.2	Rights are understood and respected	2	0.100
	I 10.1	Control and enforcement of access and use	1	0.050
	I 11.1	Security of land tenure	3	0.150
	I 12.1	Identification and registration of significant sites	3	0.150
	I 12.2	Level of satisfaction amongst users of significant sites	3	0.150
	I 13.1	Employment opportunities associated with forestry	0	0.000
	I 13.2	Compliance with labour legislation by forest owners, managers and contractors	2	0.100
	I 13.3	Remuneration of workers	3	0.150
	I 14.1	Negative impacts of forestry activities on people	2	0.100
	I 15.1	Incidence of crime	2	0.100
	I 15.2	Cost of security	2	0.100
	I 16.1	Absenteeism	2	0.100
	I 16.2	HIV/AIDS management strategies	2	0.100
	I 17.1	Effectiveness of participation	2	0.100
	I 17.2	Implementation of outcomes of participation	2	0.100
	I 17.3	Capacity to participate	2	0.100
	I 17.4	Conflict management	2	0.100
	I 18.1	Creation of forest management opportunities for disadvantaged persons	2	0.100
	I 18.2	Awareness among previously disadvantaged persons of forest management opportunities	2	0.100
TOTAL			40	2
CSD Score				2

LEGEND : SG: Sustainability Group ECO: Economic IS: Indicator Symbol
PS: Performance Score WPS: Weighted Performance Score

In Table 4.7, the CSD score of "2" indicates that this forest estate largely meets the requirements of the desired standards of forest sustainability. Two sustainability groups (environmental and economic) were assigned a weighted performance score of "1" which reflects that the forest estate of Centane largely does not meet the requirements of the desired standards of forest sustainability. However, the social sustainability group was assigned a weighted performance score of "2" which indicates that this forest largely meets the requirements of the desired social standards of forest sustainability. This picture is further unfolded in the following aspects of CSD.

Environmental indicators

Table 4.7 shows that 2 out of 18 environmental indicators were assigned a score of "0" which is the lowest score assigned in this sustainability group. These indicators are presence of rare, threatened and endangered species, and standing stock assessment. Thus, these indicators are not conforming to the desired standards of forest sustainability.

However, 2 out of 18 indicators were assigned a score of "3" which is the highest score in this sustainability group. These indicators are resource use efficiency and identification and development of new alternative forest resources. Thus, these indicators conform fully to the desired standards of forest sustainability.

Economic indicators

Table 4.7 shows that 1 out of 3 economic indicators – forestry contribution to the local economy – was assigned a score of "2", which is the highest score in this sustainability group. This indicator largely meets the requirements of the desired standards of forest sustainability.

However, 2 out of 3 economic indicators – the forestry contribution to the local development and staff turnover in forest based activities – were assigned a score of "1" which is the lowest score

in this sustainability group. These indicators largely do not meet the requirements of the desired standards of forest sustainability.

Social indicators

Table 4.7 shows that 4 out of 20 social indicators were assigned a score of "3" which is the highest score in this sustainability group. These indicators are security of land tenure, identification and registration of significant sites, level of satisfaction amongst users of significant sites and remuneration of workers. These indicators conform fully to the requirements of the desired standards of forest sustainability.

However, 1 of 20 social indicators – employment opportunities associated with forestry – was assigned a score of "0" which is the lowest score in this sustainability group. Thus, this indicator is not conforming to the requirements of the desired standards of forest sustainability.

4.3.7 Afromontane forest estate

Table 4.8 : Afromontane Forest Estate

SG	IS	Indicator Description	PS	WPS
ENV	I 1.1	Implementation of natural forest protection plans	1	0.056
	I 1.2	State of forest protection	2	0.111
	I 2.3	Presence of rare, threatened and endangered species	1	0.056
	I 3.1	Condition of natural forest margins	1	0.056
	I 3.2	Condition of natural forest cover	1	0.056
	I 3.3	Condition of understorey tree and shrub layer	1	0.056
	I 3.5	Rehabilitation of degraded natural forest areas	1	0.056
	I 4.2	Negative impacts of fire	2	0.111
	I 4.3	Infestation by alien invader plants	2	0.111
	I 5.1	Standing stock assessment	0	0.000
	I 5.2	Level or rate of resource use	2	0.111
	I 5.3	Level of multiple resource use from forest ecosystems	2	0.111
	I 5.4	Identification and development of new alternative forest resources	1	0.056
	I 5.5	Resource use efficiency	2	0.111
	I 6.2	Water quality	2	0.111
	I 6.3	Soil conservation	2	0.111
	I 6.4	Riparian zone and wetland management activities	1	0.056
	I 6.5	Pollution levels	3	0.167
TOTAL			27	2
ECO	I 7.3	Forestry's contribution to the local economy	1	0.333
	I 7.4	Forestry's contribution to the local development	1	0.333
	I 8.2	Staff turnover in forest based activities	1	0.333
TOTAL			3	1
SOCIAL	I 9.1	Opportunities for forest based activities	1	0.050
	I 9.2	Rights are understood and respected	2	0.100
	I 10.1	Control and enforcement of access and use	2	0.100
	I 11.1	Security of land tenure	3	0.150
	I 12.1	Identification and registration of significant sites	2	0.100
	I 12.2	Level of satisfaction amongst users of significant sites	2	0.100
	I 13.1	Employment opportunities associated with forestry	0	0.000
	I 13.2	Compliance with labour legislation by forest owners, managers and contractors	2	0.100
	I 13.3	Remuneration of workers	3	0.150
	I 14.1	Negative impacts of forestry activities on people	2	0.100
	I 15.1	Incidence of crime	3	0.150
	I 15.2	Cost of security	2	0.100
	I 16.1	Absenteeism	3	0.150
	I 16.2	HIV/AIDS management strategies	2	0.100
	I 17.1	Effectiveness of participation	2	0.100
	I 17.2	Implementation of outcomes of participation	2	0.100
	I 17.3	Capacity to participate	2	0.100
	I 17.4	Conflict management	1	0.050
	I 18.1	Creation of forest management opportunities for disadvantaged persons	1	0.050
	I 18.2	Awareness among previously disadvantaged persons of forest management opportunities	2	0.100
TOTAL			39	2
CSD Score				1

LEGEND : SG: Sustainability Group ECO: Economic IS: Indicator Symbol
PS: Performance Score WPS: Weighted Performance Score

In Table 4.8, the CSD score of "1" indicates that the forest estate is not largely meeting the requirements of the desired standards of forest sustainability. Two sustainability groups (environmental and social) were assigned a weighted performance score of "2" which indicates that the performance of this forest estate on this aspect of sustainability largely meets the requirements of the desired standards of forest sustainability. However, the economic sustainability group was assigned a weighted performance score of "1" which indicates failure to meet the requirements of the desired standards of forest sustainability. The presentation of scores on each parameter comprising CSD illustrates the state of sustainability of this forest estate.

Environmental indicators

Table 4.8 shows that 1 out of 18 environmental indicators – the standing stock assessment – was assigned a score of "0" which is the lowest score assigned in this sustainability group. Thus, this indicator is not conforming to the desired environmental standards of forest sustainability.

However, 1 out of 18 indicators, pollution levels, was assigned a score of "3" which is the highest score in this sustainability group. Thus, this indicator conforms fully to the desired environmental standards of forest sustainability.

Economic indicators

Table 4.8 shows that all 3 economic indicators (forestry contribution to the local economy, forestry contribution to the local development and staff turnover in forest based activities) were assigned a score of "1". These indicators largely do not meet the requirements of the desired economic standards of forest sustainability.

Social indicators

Table 4.8 shows that 4 out of 20 social indicators were assigned a score of “3” which is the highest score in this sustainability group. These indicators are security of land tenure, incidence of crime, absenteeism, and remuneration of workers. These indicators conform fully to the requirements of the desired standards of forest sustainability.

However, 1 of 20 social indicators (employment opportunities associated with forestry) was assigned a score of “0” which is the lowest score in this sustainability group. Thus, this indicator is not conforming to the requirements of the desired social standards of forest sustainability.

4.3.8 Bomvane forest estate

Table 4.9 : Bomvane Forest Estate

SG	IS	Indicator Description	PS	WPS
ENV	I 1.1	Implementation of natural forest protection plans	1	0.056
	I 1.2	State of forest protection	1	0.056
	I 2.3	Presence of rare, threatened and endangered species	0	0.000
	I 3.1	Condition of natural forest margins	1	0.056
	I 3.2	Condition of natural forest cover	0	0.000
	I 3.3	Condition of understorey tree and shrub layer	1	0.056
	I 3.5	Rehabilitation of degraded natural forest areas	1	0.056
	I 4.2	Negative impacts of fire	2	0.111
	I 4.3	Infestation by alien invader plants	1	0.056
	I 5.1	Standing stock assessment	1	0.056
	I 5.2	Level or rate of resource use	1	0.056
	I 5.3	Level of multiple resource use from forest ecosystems	2	0.111
	I 5.4	Identification and development of new alternative forest resources	2	0.111
	I 5.5	Resource use efficiency	3	0.167
	I 6.2	Water quality	0	0.000
	I 6.3	Soil conservation	0	0.000
	I 6.4	Riparian zone and wetland management activities	1	0.056
	I 6.5	Pollution levels	1	0.056
TOTAL			19	1
ECO	I 7.3	Forestry's contribution to the local economy	1	0.333
	I 7.4	Forestry's contribution to the local development	1	0.333
	I 8.2	Staff turnover in forest based activities	1	0.333
TOTAL			3	1
SOCIAL	I 9.1	Opportunities for forest based activities	1	0.050
	I 9.2	Rights are understood and respected	1	0.050
	I 10.1	Control and enforcement of access and use	1	0.050
	I 11.1	Security of land tenure	3	0.150
	I 12.1	Identification and registration of significant sites	1	0.050
	I 12.2	Level of satisfaction amongst users of significant sites	2	0.100
	I 13.1	Employment opportunities associated with forestry	3	0.150
	I 13.2	Compliance with labour legislation by forest owners, managers and contractors	2	0.100
	I 13.3	Remuneration of workers	3	0.150
	I 14.1	Negative impacts of forestry activities on people	3	0.150
	I 15.1	Incidence of crime	3	0.150
	I 15.2	Cost of security	2	0.100
	I 16.1	Absenteeism	3	0.150
	I 16.2	HIV/AIDS management strategies	2	0.100
	I 17.1	Effectiveness of participation	1	0.050
	I 17.2	Implementation of outcomes of participation	2	0.100
	I 17.3	Capacity to participate	1	0.050
	I 17.4	Conflict management	2	0.100
	I 18.1	Creation of forest management opportunities for disadvantaged persons	2	0.100
	I 18.2	Awareness among previously disadvantaged persons of forest management opportunities	2	0.100
TOTAL			40	2
CSD Score				1

LEGEND : SG: Sustainability Group ECO: Economic IS: Indicator Symbol
PS: Performance Score WPS: Weighted Performance Score

In Table 4.9, the CSD score of "1" indicates that the forest estate largely does not meet the requirements of the desired composite standards of forest sustainability. Two sustainability aspects (environmental and economic) were assigned a weighted performance score of "1" which indicates that the performance of the forest estate on these parameters largely does not meet the requirements of the desired standards of forest sustainability. However, the social sustainability performance of the estate was assigned a weighted performance score of "2" which indicates that this group largely meets the requirements of the desired social standards of forest sustainability. Scores of the aspects of CSD presented below shed more light on state of sustainability of this forest estate.

Environmental indicators

Table 4.9 shows that 4 out of 18 environmental indicators were assigned a score of "0" which is the lowest score assigned in this sustainability group. These indicators are presence of rare, threatened and endangered species, condition of natural forest cover, water quality, and soil conservation. Thus, these indicators are not conforming to the desired environmental standards of forest sustainability.

However, 1 out of 18 indicators (resource use efficiency) was assigned a score of "3" which is the highest score in this sustainability group. Thus, this environmental indicator conforms fully to the desired standards of forest sustainability.

Economic indicators

Table 4.9 shows that all 3 economic indicators (forestry contribution to the local economy, forestry contribution to the local development and staff turnover in forest based activities) were assigned a score of "1". These economic indicators largely do not meet the requirements of the desired standards of forest sustainability.

Social indicators

Table 4.9 shows that 6 out of 20 social indicators were assigned a score of “3” which is the highest score in this sustainability group. These indicators are opportunities for forest based activities, rights are understood and respected, control and enforcement of access and use, identification and registration of significant sites, effectiveness of participation and capacity to participate. Thus, these indicators conform fully to requirements of the desired social standards of forest sustainability.

However, 6 out of 20 social indicators were assigned a score of “1” which is the lowest score in this sustainability group. These indicators are security of land tenure, employment opportunities associated with forestry, remuneration of workers, negative impacts of forestry activities on people, incidence of crime and absenteeism. Thus, these social indicators largely do not meet the requirements of the desired standards of forest sustainability.

4.3.9 Port St Johns forest estate

Table 4.10 : Port St Johns Forest Estate

SG	IS	Indicator Description	PS	WPS
ENV	I 1.1	Implementation of natural forest protection plans	1	0.056
	I 1.2	State of forest protection	1	0.056
	I 2.3	Presence of rare, threatened and endangered species	1	0.056
	I 3.1	Condition of natural forest margins	1	0.056
	I 3.2	Condition of natural forest cover	1	0.056
	I 3.3	Condition of understorey tree and shrub layer	1	0.056
	I 3.5	Rehabilitation of degraded natural forest areas	1	0.056
	I 4.2	Negative impacts of fire	2	0.111
	I 4.3	Infestation by alien invader plants	1	0.056
	I 5.1	Standing stock assessment	2	0.111
	I 5.2	Level or rate of resource use	1	0.056
	I 5.3	Level of multiple resource use from forest ecosystems	2	0.111
	I 5.4	Identification and development of new alternative forest resources	2	0.111
	I 5.5	Resource use efficiency	2	0.111
	I 6.2	Water quality	1	0.056
	I 6.3	Soil conservation	2	0.111
	I 6.4	Riparian zone and wetland management activities	1	0.056
	I 6.5	Pollution levels	2	0.111
TOTAL			25	1
ECO	I 7.3	Forestry's contribution to the local economy	1	0.333
	I 7.4	Forestry's contribution to the local development	1	0.333
	I 8.2	Staff turnover in forest based activities	1	0.333
TOTAL			3	1
SOCIAL	I 9.1	Opportunities for forest based activities	1	0.050
	I 9.2	Rights are understood and respected	1	0.050
	I 10.1	Control and enforcement of access and use	1	0.050
	I 11.1	Security of land tenure	1	0.050
	I 12.1	Identification and registration of significant sites	1	0.050
	I 12.2	Level of satisfaction amongst users of significant sites	2	0.100
	I 13.1	Employment opportunities associated with forestry	3	0.150
	I 13.2	Compliance with labour legislation by forest owners, managers and contractors	2	0.100
	I 13.3	Remuneration of workers	3	0.150
	I 14.1	Negative impacts of forestry activities on people	3	0.150
	I 15.1	Incidence of crime	2	0.100
	I 15.2	Cost of security	1	0.050
	I 16.1	Absenteeism	3	0.150
	I 16.2	HIV/AIDS management strategies	2	0.100
	I 17.1	Effectiveness of participation	2	0.100
	I 17.2	Implementation of outcomes of participation	2	0.100
	I 17.3	Capacity to participate	2	0.100
	I 17.4	Conflict management	2	0.100
	I 18.1	Creation of forest management opportunities for disadvantaged persons	1	0.050
	I 18.2	Awareness among previously disadvantaged persons of forest management opportunities	2	0.100
TOTAL			37	2
CSD Score				1

LEGEND : SG: Sustainability Group ECO: Economic IS: Indicator Symbol
PS: Performance Score WPS: Weighted Performance Score

In Table 4.10, the CSD score of "1" indicates that the forest estate largely does not meet the requirements of the desired standards of forest sustainability. Two sustainability aspects (environmental and economic) were assigned a weighted performance score of "1". The environmental and economic performance of this estate indicates failure to meet the requirements of the desired standards of forest sustainability. However, the social sustainability aspect was assigned a weighted performance score of "2" which indicates that this aspect of sustainability of this forest estate largely meets the requirements of the desired standards of forest sustainability. Each of the three aspects of the composite sustainable development is highlighted below.

Environmental indicators

Table 4.10 shows that 11 out of 18 environmental indicators were assigned a score of "1" which is the lowest score assigned in this sustainability group. These indicators are implementation of natural forest protection plans, state of forest protection, presence of rare, threatened and endangered species, condition of natural forest margins, condition of natural forest canopy, condition of under storey and shrub layer, rehabilitation of degraded natural forests, infestation by alien invader plants, water quality, level or rate of resource use, and riparian zone and wetland management activities. Thus, these indicators largely do not meet the requirements of the desired standards of forest sustainability.

However, 7 out of 18 indicators were assigned a score of "2" which is the highest score in this sustainability group. These indicators are negative impacts of fire, standing stock assessment, level of multiple resource use from forest ecosystems, identification and development of new alternative forest resources, resource use efficiency, soil conservation, and pollution levels. Thus these indicators largely meet the requirements of the desired standards of forest sustainability.

Economic indicators

Table 4.10 shows that all 3 economic indicators (forestry contribution to the local economy, forestry contribution to the local development and staff turnover in forest based activities) were assigned a score of “1”. These indicators largely do not meet the requirements of the desired standards of forest sustainability.

Social indicators

Table 4.10 shows that 4 out of 20 social indicators were assigned a score of “3” which is the highest score in this sustainability group. These indicators are employment opportunities associated with forestry, remuneration of workers, negative impacts of forestry activities on people, and absenteeism. Thus, these indicators conform fully to the requirements of the desired standards of forest sustainability.

However, 7 out of 20 social indicators were assigned a score of “1” which is the lowest score in this sustainability group. These indicators are opportunities for forest based activities, rights are understood and respected, control and enforcement of access and use, security of land tenure, identification and registration of significant sites, cost of security, and creation of forest management opportunities for disadvantaged persons. Thus, these indicators largely do not meet the requirements of the desired standards of forest sustainability.

4.3.10 Willowvale forest estate

Table 4.11 : Willowvale Forest Estate

SG	IS	Indicator Description	PS	WPS
ENV	I 1.1	Implementation of natural forest protection plans	1	0.056
	I 1.2	State of forest protection	1	0.056
	I 2.3	Presence of rare, threatened and endangered species	0	0.000
	I 3.1	Condition of natural forest margins	1	0.056
	I 3.2	Condition of natural forest cover	1	0.056
	I 3.3	Condition of understorey tree and shrub layer	1	0.056
	I 3.5	Rehabilitation of degraded natural forest areas	1	0.056
	I 4.2	Negative impacts of fire	2	0.111
	I 4.3	Infestation by alien invader plants	1	0.056
	I 5.1	Standing stock assessment	0	0.000
	I 5.2	Level or rate of resource use	0	0.000
	I 5.3	Level of multiple resource use from forest ecosystems	2	0.111
	I 5.4	Identification and development of new alternative forest resources	2	0.111
	I 5.5	Resource use efficiency	2	0.111
	I 6.2	Water quality	1	0.056
	I 6.3	Soil conservation	1	0.056
	I 6.4	Riparian zone and wetland management activities	1	0.056
	I 6.5	Pollution levels	3	0.167
TOTAL			21	1
ECO	I 7.3	Forestry's contribution to the local economy	2	0.667
	I 7.4	Forestry's contribution to the local development	2	0.667
	I 8.2	Staff turnover in forest based activities	1	0.333
TOTAL			5	2
SOCIAL	I 9.1	Opportunities for forest based activities	1	0.050
	I 9.2	Rights are understood and respected	1	0.050
	I 10.1	Control and enforcement of access and use	1	0.050
	I 11.1	Security of land tenure	3	0.150
	I 12.1	Identification and registration of significant sites	1	0.050
	I 12.2	Level of satisfaction amongst users of significant sites	1	0.050
	I 13.1	Employment opportunities associated with forestry	2	0.100
	I 13.2	Compliance with labour legislation by forest owners, managers and contractors	2	0.100
	I 13.3	Remuneration of workers	3	0.150
	I 14.1	Negative impacts of forestry activities on people	2	0.100
	I 15.1	Incidence of crime	2	0.100
	I 15.2	Cost of security	2	0.100
	I 16.1	Absenteeism	2	0.100
	I 16.2	HIV/AIDS management strategies	2	0.100
	I 17.1	Effectiveness of participation	2	0.100
	I 17.2	Implementation of outcomes of participation	2	0.100
	I 17.3	Capacity to participate	3	0.150
	I 17.4	Conflict management	2	0.100
	I 18.1	Creation of forest management opportunities for disadvantaged persons	2	0.100
	I 18.2	Awareness among previously disadvantaged persons of forest management opportunities	2	0.100
TOTAL			38	2
CSD Score				2

LEGEND : SG: Sustainability Group ECO: Economic IS: Indicator Symbol
PS: Performance Score WPS: Weighted Performance Score

In Table 4.11, the CSD score of "2" indicates that this forest estate largely meets the requirements of the desired standards of forest sustainability. Two sustainability groups (economic and social) were assigned a weighted performance score of "2" which indicates the state of sustainability of this forest estate. This score illustrates that the forest largely meets the requirements of the desired standards of forest sustainability. However, the environmental sustainability aspect was assigned a weighted performance score of "1" which indicates failure of the forest estate to meet the requirements of the desired environmental standards of forest sustainability. Further light on the state of sustainability of this forest is given below.

Environmental indicators

Table 4.11 shows that 3 out of 18 environmental indicators were assigned a score of "0" which is the lowest score assigned in this sustainability group. These indicators are presence of rare, threatened and endangered species, standing stock assessment, and level or rate of resource use. Thus, these indicators are not conforming to the requirements of the desired standards of forest sustainability.

However, 1 out of 18 indicators (pollution levels) was assigned a score of "3" which is the highest score in this sustainability group. Thus, this positive indicator reflects good performance of the forest estate in satisfying the requirements of the desired environmental standards of forest sustainability.

Economic indicators

Table 4.11 shows that 2 out of 3 economic indicators (forestry contribution to the local economy and forestry contribution to the local development) were assigned a score of "2", which is the highest score in this sustainability group. These economic indicators of this forest estate are largely meeting the requirements of the desired standards of forest sustainability.

However, 1 out of 3 economic indicators (staff turnover in forest based activities) was assigned a score of “1” which is the lowest score in this sustainability group. This indicator largely does not meet the requirements of the desired economic standards of forest sustainability.

Social indicators

Table 4.11 shows that 3 out of 20 social indicators were assigned a score of “3” which is the highest score in this sustainability group. These indicators are security of land tenure, remuneration of workers, and capacity to participate. Thus, these social indicators conform fully to the requirements of the desired social standards of forest sustainability.

However, 5 of 20 social indicators were assigned a score of “1” which is the lowest score in this sustainability group. These indicators are opportunities for forest based activities, rights are understood and respected, control and enforcement of access and use, identification and registration of significant sites, and level of satisfaction amongst users of significant sites. Thus, these indicators largely do not meet the requirements of the desired standards of forest sustainability.

4.3.11 Ntsubane forest estate

Table 4.12 : Ntsubane Forest Estate

SG	IS	Indicator Description	PS	WPS
ENV	I 1.1	Implementation of natural forest protection plans	1	0.056
	I 1.2	State of forest protection	1	0.056
	I 2.3	Presence of rare, threatened and endangered species	0	0.000
	I 3.1	Condition of natural forest margins	0	0.000
	I 3.2	Condition of natural forest cover	1	0.056
	I 3.3	Condition of understorey tree and shrub layer	1	0.056
	I 3.5	Rehabilitation of degraded natural forest areas	2	0.111
	I 4.2	Negative impacts of fire	2	0.111
	I 4.3	Infestation by alien invader plants	1	0.056
	I 5.1	Standing stock assessment	1	0.056
	I 5.2	Level or rate of resource use	2	0.111
	I 5.3	Level of multiple resource use from forest ecosystems	2	0.111
	I 5.4	Identification and development of new alternative forest resources	2	0.111
	I 5.5	Resource use efficiency	3	0.167
	I 6.2	Water quality	0	0.000
	I 6.3	Soil conservation	1	0.056
	I 6.4	Riparian zone and wetland management activities	1	0.056
	I 6.5	Pollution levels	1	0.056
TOTAL			22	1
ECO	I 7.3	Forestry's contribution to the local economy	1	0.333
	I 7.4	Forestry's contribution to the local development	1	0.333
	I 8.2	Staff turnover in forest based activities	0	0.000
TOTAL			2	1
SOCIAL	I 9.1	Opportunities for forest based activities	1	0.050
	I 9.2	Rights are understood and respected	2	0.100
	I 10.1	Control and enforcement of access and use	2	0.100
	I 11.1	Security of land tenure	1	0.050
	I 12.1	Identification and registration of significant sites	2	0.100
	I 12.2	Level of satisfaction amongst users of significant sites	3	0.150
	I 13.1	Employment opportunities associated with forestry	2	0.100
	I 13.2	Compliance with labour legislation by forest owners, managers and contractors	2	0.100
	I 13.3	Remuneration of workers	3	0.150
	I 14.1	Negative impacts of forestry activities on people	2	0.100
	I 15.1	Incidence of crime	2	0.100
	I 15.2	Cost of security	1	0.050
	I 16.1	Absenteeism	3	0.150
	I 16.2	HIV/AIDS management strategies	3	0.150
	I 17.1	Effectiveness of participation	2	0.100
	I 17.2	Implementation of outcomes of participation	2	0.100
	I 17.3	Capacity to participate	2	0.100
	I 17.4	Conflict management	2	0.100
	I 18.1	Creation of forest management opportunities for disadvantaged persons	1	0.050
	I 18.2	Awareness among previously disadvantaged persons of forest management opportunities	2	0.100
TOTAL			40	2
CSD Score				1

LEGEND : SG: Sustainability Group ECO: Economic IS: Indicator Symbol
PS: Performance Score WPS: Weighted Performance Score

In Table 4.12, the CSD score of "1" indicates that the forest estate largely does not meet the requirements of the desired standards of forest sustainability. Two sustainability groups (environmental and economic) were assigned a weighted performance score of "1" which indicates the state of sustainability of this forest estate. This forest is largely failing to meet the requirements of the desired standards of forest sustainability. However, the social sustainability group was assigned a weighted performance score of "2" which indicates that the social sustainability aspect of this forest estate largely meets the requirements of the desired standards of forest sustainability.

Environmental indicators

Table 4.12 shows that 3 out of 18 environmental indicators were assigned a score of "0" which is the lowest score assigned in this sustainability group. These indicators are presence of rare, threatened and endangered species, condition of natural forest margins, and water quality. Thus, these indicators are not conforming to the requirements of the desired standards of forest sustainability.

However, 1 out of 18 environmental indicators (resource use efficiency) was assigned a score of "3" which is the highest score in this sustainability group. Thus, this indicator conforms fully to the requirements of the desired standards of forest sustainability.

Economic indicators

Table 4.12 shows that 2 out of 3 economic indicators (forestry contribution to the local economy and forestry contribution to the local development) were assigned a score of "1", which is the highest score in this sustainability group. These indicators largely do not meet the requirements of the desired standards of forest sustainability.

However, 1 out of economic indicators, staff turnover in forest based activities, was assigned a score of “0” which is the lowest score in this sustainability group. This indicator is not meeting the requirements of the desired standards of forest sustainability.

Social indicators

Table 4.12 shows that 4 out of 20 social indicators were assigned a score of “3” which is the highest score in this sustainability group. These indicators are employment opportunities associated with forestry, remuneration of workers, absenteeism and HIV/AIDS management strategies. Thus, these indicators conform fully to the requirements of the desired standards of forest sustainability.

However, 4 out of 20 social indicators – for forest based activities, security of land tenure, cost of security and creation of forest management opportunities for disadvantaged persons – were assigned a score of “1” which is the lowest score in this sustainability group. Thus, these indicators largely do not meet the requirements of the desired standards of forest sustainability.

4.4 All eleven forest estates

Table 4.13 : All Eleven Forest Estates

SG	IS	Indicator Description	APS	WPS
ENV	I 5.5	Resource use efficiency	3	0.141
	I 6.5	Pollution levels	2	0.136
	I 4.2	Negative impacts of fire	2	0.121
	I 5.4	Identification and development of new alternative forest resources	2	0.116
	I 5.3	Level of multiple resource use from forest ecosystems	2	0.111
	I 6.3	Soil conservation	2	0.086
	I 3.5	Rehabilitation of degraded natural forest areas	1	0.071
	I 4.3	Infestation by alien invader plants	1	0.066
	I 1.2	State of forest protection	1	0.061
	I 5.2	Level or rate of resource use	1	0.061
	I 6.4	Riparian zone and wetland management activities	1	0.061
	I 3.3	Condition of understorey tree and shrub layer	1	0.056
	I 1.1	Implementation of natural forest protection plans	1	0.051
	I 3.1	Condition of natural forest margins	1	0.051
	I 6.2	Water quality	1	0.051
	I 3.2	Condition of natural forest cover	1	0.045
	I 5.1	Standing stock assessment	1	0.035
	I 2.3	Presence of rare, threatened and endangered species	1	0.030
TOTAL			22	1
ECO	I 7.3	Forestry's contribution to the local economy	1	0.424
	I 7.4	Forestry's contribution to the local development	1	0.394
	I 8.2	Staff turnover in forest based activities	1	0.273
TOTAL			2	1
SOCIAL	I 13.3	Remuneration of workers	3	0.150
	I 11.1	Security of land tenure	3	0.127
	I 16.1	Absenteeism	2	0.118
	I 14.1	Negative impacts of forestry activities on people	2	0.114
	I 16.2	HIV/AIDS management strategies	2	0.109
	I 15.1	Incidence of crime	2	0.105
	I 12.2	Level of satisfaction amongst users of significant sites	2	0.100
	I 13.2	Compliance with labour legislation by forest owners, managers and contractors	2	0.100
	I 18.2	Awareness among previously disadvantaged persons of forest management opportunities	2	0.100
	I 13.1	Employment opportunities associated with forestry	2	0.091
	I 17.2	Implementation of outcomes of participation	2	0.091
	I 17.3	Capacity to participate	2	0.091
	I 17.4	Conflict management	2	0.086
	I 17.1	Effectiveness of participation	2	0.082
	I 9.2	Rights are understood and respected	2	0.077
	I 12.1	Identification and registration of significant sites	2	0.077
	I 15.2	Cost of security	2	0.077
	I 18.1	Creation of forest management opportunities for disadvantaged persons	1	0.068
	I 10.1	Control and enforcement of access and use	1	0.064
	I 9.1	Opportunities for forest based activities	1	0.050
TOTAL			40	2
Average CSD Score				1

LEGEND : SG: Sustainability Group ECO: Economic IS: Indicator Symbol
APS: Average Performance Score WPS: Weighted Performance Score

In Table 4.13, the average CSD score of "1" indicates that State indigenous forests in the Eastern Cape largely do not meet the requirements of the desired standards of forest sustainability. In these forests, two sustainability groups (environmental and economic) were assigned an average weighted performance score of "1". This score indicates that the forest estates largely do not meet the requirements of the desired standards of forest sustainability from an economic and environmental perspective. However, the social sustainability group was assigned a weighted performance score of "2" which shows that these forest estates are largely meeting the requirements of the desired social standards of forest sustainability.

Environmental indicators

Table 4.13 shows that 12 out of 18 environmental indicators were assigned a score of "0" which is the lowest score assigned in this sustainability group. These environmental indicators are rehabilitation of degraded natural forest areas, infestation by alien invader plants, state of forest protection, level or rate of resource use, riparian zone and wetland management activities, condition of under storey tree and shrub layer, implementation of natural forest protection plan, condition of natural forest margins, water quality, condition of natural forest cover, standing stock assessment, and presence of rare, threatened and endangered species. Thus, these indicators reflect that forest estates in this study are failing to conform to the requirements of the desired environmental standards of forest sustainability.

However, 1 out of 18 environmental indicators – resource use efficiency – was assigned a score of "3" which is the highest score in this sustainability group. This positive indicator illuminates resource use efficiency as the only element of environment sustainability in which the forest is fully conforming to the requirements of the desired standards of forest sustainability.

Economic indicators

Table 4.13 shows that all 3 economic indicators (forestry contribution to the local economy, forestry contribution to the local development and staff turnover in forest based activities) were assigned a score of "1". These economic indicators reflect a negative state of the economic sustainability of the forest estates in this study as they largely fail to meet the requirements of the desired economic standards of forest sustainability.

Social indicators

Table 4.12 shows that 2 out of 20 social indicators were assigned a score of "3" which is the highest score in this sustainability group. These indicators are remuneration of workers and security of land tenure. Thus, these indicators conform fully to the requirements of the desired standards of forest sustainability.

However, 3 out of 20 social indicators – creation of forest management opportunities for disadvantaged persons, control and enforcement of access and use, and opportunities for forest based activities – were assigned a score of "1" which is the lowest score in this sustainability group. Thus, these indicators largely do not meet the requirements of the desired standards of forest sustainability.

4.5 Summary

This chapter started by presenting the results of overall sustainability for all eleven forest estates on three sustainability groups: environmental, economical, and social sustainability. The results showed that the social sustainability group was more sustainable than the environmental and economic sustainability groups. The results also indicated that the overall sustainability of all State indigenous forests largely did not meet the requirements of the desired standards of forest sustainability. The results of environmental, economic and social indicators for all eleven forest estates were presented, with special focus on the highest and lowest performance scores. Lastly, the results of all the forest estates in this study showed that the State indigenous forests in the

Eastern Cape are not being managed in a sustainable manner, especially from the environmental and economic perspective.

CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

5.1 Introduction

The aim of this chapter is to discuss the findings and make recommendations in response to the following question: *"What recommendations could be made to improve the sustainability of State indigenous forests?"* Firstly, this chapter will discuss the findings as presented in Chapter 4 in the context of sustainability indicators (environmental, economic and social indicators). This will be followed by a discussion on the overall sustainability of all eleven forest estates in the Eastern Cape Province. Lastly, the chapter presents proposed recommendations to improve the sustainability of the State indigenous forests.

5.2 Conceptualisation of forest sustainability

The following sections discuss the findings of sustainability assessment of State indigenous forests across all eleven forest estates, with reference to theory as noted in Chapter 2 and sustainability indicators, namely environmental, economic and social.

5.2.1 Environmental indicators

Low performing indicators

Generally, there were no records showing the presence of rare, threatened and endangered species in most of the forest estates and this suggests the lack of monitoring of these species by the forest estates. In this regard, this indicator is considered to be the lowest performing indicator within the environmental sustainability group. The lack of monitoring could be ascribed to the shortage of trained personnel to identify and record these species. Furthermore, the general lack of standing stock (both timber and non-timber forest product species) information suggests that

there has been no assessment of the standing stock undertaken in these forests. The lack of this information impedes the determination of the supply and demand of forest products in these forests.

In most of the forest estates, there was no information that describes the condition of natural forest cover, forest margins, and under storey and shrub layer. This could be ascribed to the lack of tools such as GIS maps, Satellite images etc. to measure the degradation and destruction of the indigenous forests. Thus, the extent of degradation and destruction of these forests remains unknown. As noted in Chapter 2, Obiri *et al.* (2001:132) observed (but did not measure) the degradation and destruction in one of the forest estates under this study, Port St Johns. The lack of information on the extent of degradation of these forests delays the implementation of rehabilitation programmes. Siry and Cubbage (2003:14) suggest that the degradation and destruction of these forests could be attributed to livestock trampling and clearing of the forest margins to extend the land for crop production. These forests are not fenced and are situated in close proximity to the rural communities which depend on energy resources such as fuel wood for their livelihood needs (Shackleton *et al.*, 2007:558).

The majority of forest estates have not adequately implemented their natural forest protection plans and this suggests a poor state of protection of these forests which is evidenced by the high rate of illegal resource use occurring in these forests. This could be ascribed to the shortage of protection staff to conduct law enforcement and reduce criminal activities in these forests. Furthermore, most of the forests are densely infested by weeds and forest estates are unable to quantify the extent of infestation to inform the weed control plan.

As noted by Srivastava (2011:100) (see Section 2.2), development is still more biased towards economic growth and social justice, as evidenced by the poor performance of environmental indicators compared to the relatively good performance of social indicators in the eleven forest estates in this study.

High performing indicators

Despite the shortcomings discussed in the previous paragraphs, there were outstanding indicators in terms of performance such as the efficient use of forest resources indicator, which was the best performing indicator. Notwithstanding the illegal use of forest resources, there was no wastage observed in all these forests and this suggests efficient use of these resources. Naturally, indigenous forests have the ability to trap air pollution or dust, hence there were no signs of pollution in these forests.

Generally in most of the forest estates, there were no records or signs of fires and this suggests that the forest estates have managed to prevent the occurrence of fires. Furthermore, the indigenous forests are considered to be buffers that prevent the spread of fires.

Most forest estates have identified new alternatives (e.g. establishment of gum woodlots for the pole production) to the use of forest products (e.g. indigenous poles) as mitigating measures to the exploitation of the forests. This implies that the forest estates have conducted extensive awareness to the local communities on implications (e.g. extinction of important species) of overutilization of forest products as well as new alternatives to these products.

In most of these forest estates, there were no signs of soil erosion observed and this implies that the forest estates have handled soil erosion problems adequately.

5.2.2 Economic indicators

In general, all eleven forest estates were experiencing a problem of a high percentage of vacant posts which hinders their ability to effectively execute their forestry operations. This problem could be ascribed to a number of factors, such as lack of budget to employ new staff, delays possibly caused by stringent recruitment procedures and guidelines etc. This problem is predominantly evidenced in Gomo, Bulembu and Ntsubane forest estates which have the highest

percentages of vacancies, 95%, 71% and 87% respectively. These forest estates should consider prioritisation of their resources to fill vacant posts in order to pursue forest sustainability in their indigenous forests.

The poor performance of the indicators on the contribution to local development and the local economy could be attributed to the shortage of skilled management staff to drive local economic development through use of forest resources and lack of budget allocation to local development projects. Thus, the contribution to local development could strengthen the relationship between the forest estates and local communities. These indicators can complement each other in order to achieve forest sustainability. For example, the filling of vacant posts with candidates from local communities will indirectly contribute to the development of those communities by reducing the unemployment rate. Thus, the value of the contribution of the communities to the sustainability of the forests should not be overlooked, henceforth the government should explore programmes that will contribute to the development of local communities adjacent to the forests.

5.2.3 Social indicators

Low performing indicators

Although most of the social indicators performed well in most of the forest estates, some indicators such as opportunities for forest based activities, control and enforcement of access and use, and creation of forest management opportunities for disadvantaged persons, did not perform according to required standards of forest sustainability. The poor performance of these indicators can be ascribed to the lack of information on sustainable harvesting yields of forest products to allow access to their use. This is compounded by the challenge regarding the filling of vacant posts, in particular by recruitment of the previously disadvantaged persons. However, there are many legal and policy instruments in the South African government that seek to encourage the employment of disadvantaged persons, such as the Employment Equity Act, 55 of 1998, and procuring of goods and services from previously disadvantaged persons, such as the Preferential

Procurement Policy Framework Act, 5 of 2000. These two pieces of legislation can be used to improve the performance of the abovementioned indicators. Existing recruitment procedures and guidelines of the DAFF encourage recruitment of new employees from the local communities. This challenge seemed to be prevalent in Keiskammahoek forest estate where no forest management opportunities for disadvantaged persons were created.

High performing indicators

In spite of the poor performance of indicators discussed in the preceding paragraphs, two social indicators – as remuneration of workers and security of land tenure – performed exceptionally well. The good performance associated with the remuneration of workers could be attributed to the fact that the salaries of State employees are determined nationally and are not equated to the salaries of workers in the private sector. The norm is that general workers in government are paid more than general workers in the private sector in the same industry.

Furthermore there are no disputes with regard to security of land tenure and this could be attributed to the fact the beacons for State forests are clearly visible and limit opportunities for contestation of the land by the neighbouring communities.

5.2.4 Overall sustainability of State indigenous forests in the Eastern Cape

Generally, in all forest estates, social indicators showed better performance than environmental and economic indicators as indicated by their performance scores. This good performance can be attributed to the availability of satisfactory comments from the users of the significant sites, compliance to labour legislation, the remuneration of existing employees with salaries above the forest industry norms, low incidence of crime, effective HIV/AIDS management strategies and low absenteeism. However, the economic indicators showed worse performance compared to environment and social indicators. This poor performance can be largely ascribed to the high percentage of vacant posts which indirectly affects local economic development of the

surrounding communities. As noted by Moffat (2000) social and environmental concerns receive more attention from State institutions than from private institutions, while economic concerns receive more attention from private institutions than from State institutions. Perhaps this is the reason why economic indicators perform worse than environmental and social indicators.

The majority of forest estates did not fully embrace the integration of environmental, economic and social indicators as reflected by the variation of the average weighted performance scores of the sustainability groups. As noted by Elkington (2005), key principles of sustainability have not been fully integrated. This indicates that the existing forest management regime is focusing more on social issues than environmental and economic issues, which is not unusual in State managed assets. Therefore the balance between sustainability dimensions could be reached if the forest management regime could shift their resources towards addressing environmental and economic concerns too.

5.3 Recommendations

In view of the current state of sustainability of forest estates as presented in the previous chapter and the discussions in the previous paragraphs in this chapter, the following recommendations for implementation by the forest estates are suggested:

- Arrange the indicators in order of performance based on the results of this study (e.g. from worst performing indicator to the best performing) using the ranking method or pair-wise comparison method.
- Develop plans to address the existing performance gaps of indicators.
- Quantify and cost the required resources to implement the plans starting from the worst performing indicator to the best performing indicator.
- Explore the funding options (e.g. State funds and donor funds) internally and externally to procure the required resources.

- Explore cost-effective intervention strategies relevant to address performance gaps such as green intervention strategies without harming the environment.
- Explore alternative uses to save consumptive forest products. For example, some communities depend on wood from these indigenous forests for fuel as their source of energy. Thus, it is imperative to explore cost-effective green energy sources such as solar systems, gas energy, coal electricity, etc.
- Investigate the use of internal and external incentive schemes to encourage forest sustainability (e.g. existing State incentive framework for best performing employees and carbon trading projects).
- Review the effectiveness and relevance of existing institutional arrangements such as participatory forest management committees to improve forest sustainability.
- Improve reporting across all levels of forest management to promote information flow.

It is further recommended that during the next audits, the indicators should be ranked in order of their importance using ranking or pair-wise comparison methods. Now that the baseline audits have been conducted, the next audits should focus on determining the performance change of indicators since the previous audits. This will determine whether the sustainability of the forest estates is improving or not.

5.3.1 Environmental protection

It is recommended that the forest estates should:

- Provide necessary financial resources (budget) to employ more protection personnel as required by the existing structure.
- Procure protection equipment necessary for the implementation of natural forest protection plans that seek to protect the forests against poachers of plants and animals.
- Design and maintain the register of rare, threatened and endangered species to monitor the change in the biodiversity of forests.

- Discourage the clearing of forests to provide open land for agricultural expansion by local communities, through the use of effective awareness campaigns and enforcement of environmental legislations including the National Forests Act no. 84 of 1998.
- Source green funds from internal and external sources to rehabilitate the degraded indigenous forests.

5.3.2 Economic prosperity

It is recommended that the forest estates should:

- Fill the vacant posts through offering them to the candidates coming from the local communities, which will eventually increase the positive contribution of the forest estates to the local economy and development.
- Conduct research on supply and demand of forest resources needed to improve forestry contribution to the local economy and local development.

5.3.3 Social justice

It is recommended that the forest estates should:

- Create opportunities for disadvantaged persons to participate in the management activities through creation of jobs and giving preference of the procurement of goods and services in terms of Employment Equity Act no. 55 of 1998 and Preferential Procurement Policy Framework Act no. 5 of 2000 respectively.

- Provide training and resources relevant to capacitate the local communities in order to actively participate in the management of State indigenous forests through existing participatory forest management committees. In cases where these committees do not exist, they should be established.

- Implement the outcomes of deliberations between the forest managers and communities decided in the meetings of participatory forest management committees in order to gain confidence of communities by ensuring their commitment to the sustainable management of forests.

CHAPTER 6: CONCLUSION

The purpose of this research was to respond to the following questions:

1. What is the state of sustainability of State indigenous forests in the Eastern Cape?
2. What recommendations could be made to improve the sustainability of State indigenous forests?

This research firstly reviewed the literature relevant to the scope of the study. The concepts of sustainable development, sustainable forest management, criteria and indicators were investigated, described and discussed in detail to lay the foundation for this study. The concept of sustainable development, which has evolved since the early 19th century, is the key concept which formed the bedrock of this study. Although the concept was subjected to criticisms, it gained popularity towards the end of the 19th century, leading to the adoption of its global definition, which is now widely accepted.

The integrated composite sustainable development model was adopted in this research as the method to measure the state of sustainability of State indigenous forests. The framework of this model was described in detailed in Chapter 2 and used in Chapter 3 for data analysis. In this model, the appropriate indicators of sustainable forest management were adopted from the South African set of PCI&S to measure their performance against the desired sustainability standards. In total, 41 indicators were measured and analysed for this research. As noted in Chapter 3, the audit and the scoring of the indicators were done by a team of independent experts in 2009. Both numeric and narrative information from the audit project were collected and analysed to respond to the research questions.

The results from the data analysis process were presented in Chapter 4, in search of a response to the question that seeks to determine the state of sustainability of State indigenous forests. In

Chapter 4, the findings were presented in the context of environment, economic and social indicators for all eleven forest estates, individually and combined. Thus, it was easy to determine the state of sustainability for each forest estate and also for all forest estates combined. It transpired from the findings that only 4 out of 11 forest estates (Keiskammahoek, Ngqeleni, Centane and Willowvale) largely meet the desired standards of forest sustainability, the rest of the forest estates largely do not meet the desired standards of forest sustainability. Furthermore, only 3 out of 11 forest estates were allocated a weighted performance score of "2" under the environmental sustainability group and the rest of forest estates were only allocated a weighted performance score of "1". However, all eleven forest estates were allocated a weighted performance score of "2" under the social sustainability group, and this suggests that all eleven forest estates are largely meeting the requirements of the desired social standards of forest sustainability. Chapter 4 concluded that the State indigenous forests in the Eastern Cape Province are not sustainably managed.

The purpose of Chapter 5 was to determine the recommendations relevant for improving the sustainability of State indigenous forests. These recommendations were mainly based on seeking solutions for poor performing indicators in each sustainability group.

In conclusion, it is recommended that the audits be conducted every three years in order to evaluate the improvement of forest sustainability and also to assess whether the recommendations were effective or not. These audits should also cover the ranking of indicators in order of importance.

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6. APPENDICES

Appendix 1: Criteria and Indicators Checklist

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
CRITERION 1: Natural forests are protected	Indicator 1.1: Implementation of natural forest protection plans	Management Goal: Number of protection personnel matches the required number as estimated by the forest manager to effectively manage the threats to the natural forest.	Measure 1.1.1: Percentage of forest protection posts on staff establishment that have been filled					
		Management Goal: Budget allocation is sufficient to fill personnel requirements, equip staff appropriately, and undertake necessary activities	Measure 1.1.2: Budget allocated to natural forest protection					
	Indicator 1.2: State of forest protection	Management Goal: Number of transgressions is decreasing	Measure 1.2.2: Number and type of reported transgressions					
		Management Goal: Appropriate actions applied to address all transgressions	Measure 1.2.3: Number & type of enforcement actions to address transgressions/offences.					
CRITERION 2: Biodiversity of natural forests is conserved	Indicator 2.3: Presence of rare, threatened and endangered species	Management Goal: Rare, threatened and endangered species are monitored on a regular basis and results are used to improve management of biodiversity	Measure 2.3.1: Number of rare, threatened and endangered species (RT&E), and number of individuals sighted, during monitoring activities					

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
CRITERION 3: Natural forest ecosystem structures are conserved and processes maintained	Indicator 3.1: Condition of natural forest margins	Management Goal: Forest margins to be managed according to the prescribed standards, and the length of margins bordering on natural ecosystems to be maintained or increased	Measure 3.1.1: Percentage of the length of natural margins relative to length of the total forest margin					
		Management Goal: There is no clearing of ecotone for alternative land use	Measure 3.1.2: The percentage of the natural forest margin that has been cleared for alternative land use					
	Indicator 3.2: Condition of natural forest canopy	Management goal: Artificial degradation of forest canopy is decreasing	Measure 3.2.1: Percentage of total forest canopy area which has been artificially degraded					
		Management goal: There is no clearing of natural forest for alternative land use other than for national/provincial strategic purposes	Measure 3.2.2: Area of natural forest cleared for alternative land use					
	Indicator 3.3: Condition of under storey tree and shrub layer	Management goal: Artificial degradation of understory is decreasing	Measure 3.3.1: Percentage of total forest understory area that has been artificially degraded					
		Management goal: Incidence of livestock induced damage is constant or decreasing	Measure 3.3.2: Number and area (ha) of sites affected by trampling by livestock					
	Indicator 3.5: Rehabilitation of degraded natural forest areas	Management goal: The number and area of sites requiring rehabilitation is decreasing, and all areas requiring rehabilitation have rehabilitation plans	Measure 3.5.1: The number and area (ha) of sites identified as requiring rehabilitation					

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
		Management goal: The number of sites not being addressed that still require rehabilitation. Areas that have undergone rehabilitation should be showing levels of improvement.	Measure 3.5.3: The number and area (ha) of sites that are being rehabilitated as a percentage of the total number and area of sites requiring rehabilitation					
CRITERION 4: Forests are protected from negative effects of fire, pests and diseases, and alien invader plants	Indicator 4.4: Negative impacts of fire	Management goal: There are no uncontrolled fires affecting the natural forests and plantations	Measure 4.4.1: Number and area (ha) of sites affected by uncontrolled fires					
		Management goal: Fire protection expenditure is decreasing in correlation with a decrease in the incidents and area affected by uncontrolled fires	Measure 4.4.2: Percentage change in annual fire protection expenditure					
		Management goal: Value of losses is decreasing	Measure 4.4.3: Value of losses resulting from fire damage after salvage					
	Indicator 4.3: Infestation by alien invader plants	Management goal: Intensity of infestation is decreasing	Measure 4.3.1: Intensity of infestation of alien invader plants					

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
CRITERION 5: Production potential is maintained or improved	Indicator 5.1: Standing stock assessment	Management Goal: Standing stock of targeted resources is known and managed sustainably	Measure 5.1.1: Regularly updated inventories of the available consumptive resources (plants/ha, volume/ha, tons/ha, or related measure).					
	Indicator 5.2: Level or rate of resource use	Management goal: Annual harvests do not exceed the potential productivity	Measure 5.2.1: Ratio of annual removals to annual growth (Increment)					
	Indicator 5.3: Level of multiple resource use from forest ecosystems	Management goal: Number and range of benefits and activities should be maximised without compromising or conflicting the core business or other land uses.	Measure 5.3.1: List of resource use activities taking place on the FMU					

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
	Indicator 5.4: Identification and development of new alternative forest resources	Management goal: Number of successful initiatives to produce alternative forest resources is increasing	Measure 5.4.4: Number and extent of initiatives to produce alternative forest resources for local resource users					
	Indicator 5.5: Resource use efficiency	Management goal: The ratio of wasted to harvested volume of timber is decreasing	Measure 5.5.1: Percentage of total resource (timber or NTFP) that is wasted after harvesting					
CRITERION 6: Soil and water resources are conserved	Indicator 6.2: Water quality	Management Goal: Negative impacts from management actions on water quality are minimized	Measure 6.2.2: Water turbidity and debris in water courses in the vicinity which high impact activities are taking place					
	Indicator 6.3: Soil conservation	Management goal: Area affected by erosion is decreasing	Measure 6.3.1: Area (ha) affected by soil erosion resulting from inadequate management activities					
		Management goal: Corrective action is implemented at increasing percentage of incidence of erosion induced by inadequate management activities, and is leading to rehabilitation of eroded areas	Measure 6.3.2: Percentage of the incidence of erosion addressed by corrective actions					

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
	Indicator 6.4: Riparian zone and wetland management activities	Management goal: Riparian zones are healthy and functioning properly	Measure 6.4.1: Percentage of degraded riparian zones being rehabilitated					
	Indicator 6.5: Pollution levels	Management goal: Number of pollution incidents is decreasing	Measure 6.5.1: Number and type of reported pollution incidents					
		Management goal: : Ensure that only chemicals listed on the "Timber Industry Pesticide Working Group Approved Pesticide List for Plantations" are used and the application of chemicals does not exceed dosage	Measure 6.5.2: Type and volume/ha of chemicals, that are registered as having potentially harmful impacts, that are applied for management activities on the FMU annually					
CRITERION 7: Forests make a positive contribution to the economy	Indicator 7.3: Forestry's contribution to the local economy	Management Goal: Value to local economy should be optimised	**Measure 7.3.1:** Annual income to the FMU from sales of timber and NTFPs, and other income generating activities from the FMU					
		Management Goal: Value to local economy should be optimised	**Measure 7.3.2:** Annual value of salaries, wages and contracts paid or awarded by the FMU					
	Indicator 7.4: Forestry's contribution to local development	Management Goal: Realistic contribution from FMU to local development	**Measure 7.4.3:** Number, type and value of local developments funded or supported by the FMU					

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
CRITERION 8: The forest economy is resilient	Indicator 8.2: Staff turnover in forest based business	Management Goal: The FMU is consistent with industry norms	**Measure 8.2.1:** The number of employees that leave the FMU within a year expressed as a percentage of the total staff compliment					
		Management Goal: All positions are filled and there is a complete work force	**Measure 8.2.2:** The percentage of positions in staff complement that are filled					
		Management Goal: The FMU is consistent with industry norms	**Measure 8.2.3:** Number of contracts with contractors that are terminated or not renewed as a percentage of the total number of contracts for the FMU					
	Indicator 8.3: Taxes, levies and charges paid by forestry	Management Goal: Percentage paid in licences, taxes and levies should be constant or deceasing	**Measure 8.3.1:** The total cost of licences, taxes, levies and rates paid by the FMU as a percentage of total operating cost					
CRITERION 9: People have rights to access and use of forests	Indicator 9.1: Opportunities for forest based activities	Management Goal: Range of sustainable forest related activities are optimised	**Measure 9.1.1:** Types of activities and resource use taking place on the FMU that require access by users					
		Management Goal: Destructive or negative impacts arising from activities are minimised.	**Measure 9.1.2:** Negative impacts resulting from specific activities and resource usage					
		Management Goal: There is an optimal range of users, which is stable or increasing within sustainable limits	**Measure 9.1.3:** Number of forest user groups and number of users in each group					

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
		Management Goal: Forest estate zoned and managed to allow a range of resource use or other activities to take place within sustainable limits	**Measure 9.1.5:** Area (ha) accessible to user groups per resource use or activity					
	Indicator 9.2: Rights are understood and respected	Management Goal: Incidents of conflict related to access and use rights are minimised	**Measure 9.2.1:** Incidence of conflict between forest managers and owners and people practising their access and use rights					
CRITERION 10: Forests are used responsibly	Indicator 10.1: Control and enforcement of access and use	Management Goal: Licenses granted accurately reflect the activities taking place in the natural forest	**Measure 10.1.1:** Number of permits or licenses granted for licensed activities (					
		Management Goal: Access and use infringement are reducing	**Measure 10.1.2:** Number of infringements of license / permit or exemption conditions					
CRITERION 11: Land tenure of forest areas is clearly defined, recognised and secure	Indicator 11.1: Security of land tenure	Management Goal: Land ownership is uncontested and land claims have been clearly settled	**Measure 11.1.1:** Number of disputes over land tenure					
		Management Goal: Number of disputes decreasing and the forest owner or manager is compliant with Extension of Security of Tenure	**Measure 11.1.3:** Number of disputes over boundaries and/or rights of occupation					

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
		Act (Act 67 of 1997) and the Interim Protection of Informal Land Rights Act (Act 31 of 1996)						
CRITERION 12: Cultural, ecological, recreational, historical, aesthetic and spiritual sites and services supplied by forests are maintained	Indicator 12.1: Identification and registration of significant sites	Management Goal: Sites are recorded and managed according to specific prescriptions and legal obligations.	**Measure 12.1.1:** Inventory of significant sites on FMU					
	Indicator 12.2: Level of satisfaction among users of significant sites	Management Goal: Stakeholders are satisfied with the services supplied by significant sites	**Measure 12.2.1:** Number of complaints (verbal or written) received from users of significant sites					
CRITERION 13: The distribution of employment benefits from forests is fair	Indicator 13.1: Employment opportunities associated with forestry	Management Goal: Percentage of labour force employed from local areas is optimised within the constraints of sustainable business practice	**Measure 13.1.1:** Percentage of labour force employed from local areas					
		Management Goal: Strive towards achieving targets set in Employment Equity Plan	**Measure 13.1.2:** Distribution (percentage) of race, gender and disability within the occupational categories of employees of the forest enterprise					

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
	Indicator 13.2: Compliance with labour legislation by forest owners, managers and contractors	Management Goal: There are no transgressions of labour legislation The forest owner or manager takes co-responsibility for ensuring contractor compliance with labour legislation	**Measure 13.2.1**: The number and type of transgressions of labour legislation					
		Management Goal: Worker accommodation makes adequate provision for shelter, sanitation, cooking facilities, drainage, ventilation, access to potable water, and avoids overcrowding. Provision is made for recreational facilities The forest owner or manager takes co-responsibility for ensuring contractor compliance with labour legislation	**Measure 13.2.3:** Quality and condition of worker accommodation					
		Management Goal: Compliance with relevant legislation The forest owner or manager takes co-responsibility for ensuring contractor compliance with relevant legislation	**Measure 13.2.4:** Quality and availability of health and safety equipment and clothing					
		Management Goal: Compliance with relevant legislation The forest owner or manager takes co-responsibility for ensuring contractor compliance with relevant legislation	**Measure 13.2.5:** Quality and condition of worker transport					

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
		Management Goal: Regular training is provided to maintain or improve the skills of the staff	**Measure 13.2.6:** Number and range of training initiatives provided to promote skills development in workforce					
	Indicator 13.3: Remuneration of workers	Management Goal: Wage and salary rates conform to industry and State norms and sectoral determination.	**Measure 13.3.2:** Wage and salary rates by category within the FMU					
CRITERION 14: The distribution of the costs from forestry is fair	Indicator 14.1: Negative impacts of forestry activities on people	Management Goal: Minimise the negative impacts of forestry activities on people	**Measure 14.1.1:** Inventory of negative impacts and the number and type of complaints related thereto, arising from the forestry activities on the FMU.					
CRITERION 15: Crime in forestry areas is minimised	Indicator 15.1: Incidence of crime	Management Goal: Crime incidents should be decreasing	**Measure 15.1.1:** Number and type of incidents of crime on FMU					
	Indicator 15.2: Cost of security	Management Goal: The cost per hectare should be commensurate with security risks	**Measure 15.2.1:** Cost per hectare spent on security on the FMU					
CRITERION 16: Forestry contributes to the reduction of HIV/AIDS and its resultant impacts	Indicator 16.1: Absenteeism	Management Goal: Management plans to minimise absenteeism (including HIV /Aids Management Strategy) result in a decrease in absenteeism	**Measure 16.1.1:** Percentage of employees absent from work measured as a trend					

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
		Management Goal: Employees assigned to light work are assisted to access health care and nutritional advice	**Measure 16.1.2:** Number of employees assigned to light work as a percentage of the total workforce					
	Indicator 16.2: HIV/AIDS management strategies	Management Goal: An HIV/AIDS prevention strategy should be in place and implemented	**Measure 16.2.1:** Evidence of implementation of an HIV/AIDS strategy					
CRITERION 17: There is effective stakeholder participation in forestry management	Indicator 17.1: Effectiveness of participation	Management Goal: All relevant stakeholders should be identified and recorded on a database	**Measure 17.1.2:** List of stakeholders identified, including disadvantaged and marginalized groups					
		Management Goal: Regular engagement with affected stakeholders is implemented	**Measure 17.1.4:** Frequency of participatory interactions					
	Indicator 17.2: Implementation of outcomes of participation	Management Goal: Outcomes and joint decisions should be implemented	**Measure 17.2.1:** Number and type of issues raised during stakeholder participation that are integrated into management planning and implementation					
	Indicator 17.3: Capacity to participate	Management Goal: Stakeholders identified on stakeholder list engage with forest management	**Measure 17.3.1:** Evidence of active participation by identified stakeholders					
		Management Goal: There are capacity building processes in place where necessary	**Measure 17.3.2:** Evidence of capacity building processes among stakeholders lacking in capacity					

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
		Management Goal: Non-scientific type of information should be available to all stakeholders	**Measure 17.3.3:** Availability of information that is understandable to stakeholders in the participation process					
	Indicator 17.4: Conflict management	Management Goal: Number of complaints and conflict should be decreasing	**Measure 17.4.4:** Incidence of complaints and conflict between management and stakeholders					
CRITERION 18: Forests are developed and managed so that persons or categories of persons disadvantaged by unfair discrimination are advanced	Indicator 18.1: Creation of forest management opportunities for disadvantaged persons	Management Goal: The number of opportunities for previously disadvantaged persons is increasing.	**Measure 18.1.1:** Number and type of opportunities generated to benefit previously disadvantaged persons					
	Indicator 18.2: Awareness among previously disadvantaged persons of forest management opportunities	Management Goal: For every provincially or locally specific opportunity there must be a dedicated awareness-raising campaign run by the relevant authority or forest owner	**Measure 18.2.1:** Number and nature of initiatives to inform previously disadvantaged persons of forest-based opportunities					
		Management Goal: Forest opportunities are communicated in languages and media appropriate to the local context	**Measure 18.2.2:** Languages and media used to communicate initiatives					

Criterion	Indicator	Management Goal	Measure	Measure rating	Report	Indicator score	Observations (objective evidence)	CAR
		Management Goal: An increase in the number of applications resulting from the awareness campaigns.	**Measure 18.2.4:** Number of applications received from previously disadvantaged persons, to take up opportunities on the FMU					

Appendix 2: A letter of permission to conduct research

agriculture

Department:
Agriculture
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Enq: Wisemen Yako
E-mail: yakow@dwa.gov.za.

To Whom It May Concern:

RESEARCH ON INDIGENOUS FORESTS IN THE EASTERN CAPE

This serves to confirm that the Indigenous Forest Management subdirectorate of the Department of Agriculture, Forestry and Fisheries has granted Mr N Quvile permission to pursue his research studies on indigenous forests in the Eastern Cape.

Regards,

W Yako
DEPUTY DIRECTOR (ACTING): INDIGENOUS FOREST MANAGEMENT (EASTERN CAPE)
DATE: 9 APRIL 2010

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Appendix 3: CIFOR Generic Template of Criteria and Indicators

P	C	I	Description
1			Policy, planning and institutional framework are conducive to sustainable forest management
	1.1		There is sustained and adequate funding for the management of forests
		1.1.1	Policy and planning are based on recent and accurate information
		1.1.2	Effective instruments for inter-sectoral coordination on land-use and land management exist
		1.1.3	A Permanent Forest Estate (PFE), which includes both protection and production forests and is the basis for sustainable management, exists and is protected by law
		1.1.4	There is a regional land use plan (or PFE) which reflects the different forested land uses, and give attention to such factors as population, agriculture, conservation, environmental, economic and cultural values
		1.1.5	Institutions responsible for forest management and research are adequately funded and staffed
	1.2		Precautionary economic policies exist
		1.2.1	Reserve funds for potential damages are available (performance bond)
		1.2.2	Anti-corruption provisions have been implemented
	1.3		Non forestry policies do not distort forest management
		1.3.1	Absence of agricultural sector incentives for production expansion
		1.3.2	Absence of price controls on domestic food production
		1.3.3	Absence of price controls on fuel oils
		1.3.4	Absence of distorting resettlement policies
		1.3.5	Absence of distorting exchange rate over or under-valuation
	1.4		A functioning buffer zone exists
		1.4.1	Low level of conflict at forest management unit (FMU) boundary
		1.4.2	Local respect for FMU boundary
		1.4.3	Forest management (e.g., company, concession) has demonstrated attempts to protect FMU boundaries
	1.5		Legal framework protects access to forest and forest resources
		1.5.1	Security of tenure is clear and documented
		1.5.2	Existence of non-confiscatory land use policy
		1.5.3	Existence of property rights for exploited non-timber forest products (NTFPs) (e.g. fuel wood)
		1.5.4	Land tenurial prerequisite policy does not discriminate against forestry
		1.5.5	Efficient equivalence log price/export log price
		1.5.6	Transparent system of concession allocation
	1.6		Demonstrated reinvestment in forest-use options
		1.6.1	Absence of excessive capital mobility (promoting 'cut and run')
2			Maintenance of ecosystem integrity
	2.1		The processes that maintain biodiversity in managed forests (FMUs) are conserved
		2.1.1	Landscape pattern is maintained
		2.1.2	Change in diversity of habitat as a result of human interventions are maintained within critical limits as defined by natural variation and/or regional conservation objectives
		2.1.3	Community guild structures do not show significant changes in the representation of especially sensitive guilds, pollinator and disperser guilds

P	C	I	Description
		2.1.4	The richness/diversity of selected groups show no significant change
		2.1.5	Population sizes and demographic structures of selected species do not show significant change, and demographically and ecologically critical life-cycle stages continue to be presented.
		2.1.6	The status of decomposition and nutrient cycling shows no significant change
		2.1.7	There is no significant change in the quality and quantity of water from the catchment
	2.2		**Ecosystem function is maintained**
		2.2.1	No chemical contamination to food chains and ecosystem
		2.2.2	Ecologically sensitive areas, especially buffer zones along watercourses, are protected
		2.2.3	Representative areas, especially sites of ecological importance, are protected and appropriately managed
		2.2.4	Rare or endangered species are protected
		2.2.5	Erosion and other forms of soil degradation are minimised
	2.3		**Conservation of the processes that maintain genetic variation**
		2.3.1	Level of genetic diversity are maintained within critical limits
		2.3.2	There is no directional change in genotypic frequencies
		2.3.3	There are no changes in gene flow/migration
		2.3.4	There are no changes in the mating system
3			Forest management maintains or enhances fair intergenerational access to resources and economic benefits
	3.1		**Local management is effective in controlling maintenance of, and access to, the resource**
		3.1.1	Ownership and use rights to resources (inter- and intragenerational) are clear and respect preexisting claims
		3.1.2	Rules and norms of resource use are monitored and successfully enforced
		3.1.3	Means of conflict resolution function without violence
		3.1.4	Access to forest resources is perceived locally to be fair
		3.1.5	Local people feel secure about access to resources
	3.2		**Forest actors have a reasonable share in the economic benefits derived from forest use**
		3.2.1	Mechanisms for sharing benefits are seen as fair by local communities
		3.2.2	Opportunities exist for local and forest-dependent people to receive employment and training from forest companies
		3.2.3	Wages and other benefits conform to national and/or International Labour Organisation (ILO) standards
		3.2.4	Damages are compensated in a fair manner
		3.2.5	The various forest products are used in an optimal and equitable way
	3.3		**People link their and their children's future with management of forest resources**
		3.3.1	People invest in their surroundings (i.e., time, effort, and money)
		3.3.2	Out-migration levels are low
		3.3.3	People recognise the need to balance number of people with natural resource use
		3.3.4	Children are educated (formally and informally) about natural resource management
		3.3.5	Destruction of natural resources by local communities is rare
		3.3.6	People maintain spiritual or emotional links to the land

P	C	I	Description
4			Concerned stakeholders have acknowledged rights and means to manage forests cooperatively and equitably
	4.1		Effective mechanisms exist for two-way communication related to forest management among stakeholders
		4.1.1	> 50% of timber company personnel and forestry officials speak one or more local language, or > 50% local women speak the national language used by the timber company in local interactions
		4.1.2	Local stakeholders meet with satisfactory frequency, representation of local diversity, and quality of interaction
		4.1.3	Contributions made by all stakeholders are mutually respected and valued at a generally satisfactory level
	4.2		Local stakeholders have detailed, reciprocal knowledge pertaining to forest resource use (including user groups and gender roles), as well as forest management plans prior to implementation
		4.2.1	Plans/maps showing integration of uses by different stakeholders exist
		4.2.2	Updated plans, baseline studies and maps are widely available, outlining logging details such as cutting areas and road construction, and include temporal aspects
		4.2.3	Baseline studies of local human systems are available and consulted
		4.2.4	Management staff recognises the legitimate interests and rights of other stakeholders
		4.2.5	Management of NTFP reflects the interests and rights of local stakeholders
	4.3		Agreement exists on rights and responsibilities of relevant stakeholders
		4.3.1	Level of conflict is acceptable to stakeholders
5			The health of the forest actors, cultures and the forest is acceptable to all stakeholders
	5.1		There is a recognisable balance between human activities and environmental conditions
		5.1.1	Environmental conditions effected by human uses are stable or improving
		5.1.2	In-migration and/or natural population increases are in harmony with maintaining the forest
	5.2		The relationship between forest management and human health is recognised
		5.2.1	Forest managers cooperate with public health authorities regarding illnesses related to forest management
		5.2.2	Nutritional status is adequate among local populations
		5.2.3	Forest employers follow ILO work and safety regulations and take responsibility for the forest-related health risks of workers
	5.3		The relationship between forest maintenance and human culture is acknowledged as important
		5.3.1	Forest managers can explain links between relevant human cultures and the local forest
		5.3.2	Forest management plans reflect care in handling human cultural issues
		5.3.3	There is no significant increase in signs of cultural disintegration
6			Yield and quality of forest goods and services are sustainable
	6.1		Forest management unit is implemented on the basis of legal title on the land, recognised customary rights, or clear lease agreements
		6.1.1	Documentary evidence of the agreements with local communities under which management is entitled to manage the forest exists

P	C	I	Description
		6.1.2	Information on the identity, location and population of all indigenous and traditional peoples living in the vicinity of the management area or claiming customary rights to the management area exists
		6.1.3	Evidence or statements from the representative organisations of local indigenous or traditional communities defining the extend of their territories exist, and include maps
	6.2		**Management objectives are clearly and precisely described and documented**
		6.2.1	Objectives are clearly stated in terms of the major functions of the forests, with due respect to their spatial distribution
	6.3		**Forest management plan is comprehensive**
		6.3.1	A comprehensive forest management plan exists
		6.3.2	Management take place with appropriate involvement of the stakeholders and takes into account all the components and functions of the forest, such as timber production, NTFP, ecology and well-being of local populations
		6.3.3	Yield regulation by area and/or volume prescribed
		6.3.4	Silvicultural systems prescribed and appropriate to forest type and produce grown
		6.3.5	Harvesting systems and equipment are prescribed to match forest conditions in order to reduce impact
		6.3.6	Management plan is periodically submitted to revision
	6.4		**Implementation of the management plan is effective**
		6.4.1	The forest unit is zoned into areas to be managed for various objectives
		6.4.2	Boundaries are marked in the field
		6.4.3	Inventory of all forest uses and products are available
		6.4.4	Workers and staff have adequate training to implement management
		6.4.5	Infrastructure is laid out prior to harvesting and in accordance with prescriptions
		6.4.6	Low residual stand damage
		6.4.7	Rehabilitation of degraded and impacted forest is undertaken in accordance with a code of practice
		6.4.8	Absence of significant off-site impacts such as on down stream water quality/quantity, infrastructure etc.
		6.4.9	Systems for production and transformation of forest products are efficient
	6.5		**An effective monitoring and control system audit's management's conformity with planning**
		6.5.1	Continuous Forest Inventory (CFI) plots are established and measured regularly
		6.5.2	Documentation and record of all forest management and forest activities are kept in forms that enable monitoring
		6.5.3	Worked coupes are protected (e.g. from fire, encroachment and premature re-entry)
		6.5.4	Tree marking of seed stock and potential crop trees is practised
		6.5.5	Results derived from monitoring and research, as well as any additional scientific and technical information, are incorporated into the implementation and revision of the management plan
	6.6		**Equitable distribution and presence of economic rent**
		6.6.1	Estimated government rent capture
		6.6.2	Estimated operator (manager) rent capture
		6.6.3	Estimated forest local dwellers rent capture