PROGRESS REPORT
PROTECTED AREA PLANING FOR NATURAL FORESTS

SOCIAL, CULTURAL AND ECONOMIC CONSIDERATIONS FOR NATURAL FOREST PROTECTED AREA SELECTION

Prepared for

DWAF WFSP Forestry Programme

Funded by

Department for International Development

Prepared by

Derek Berliner
Eco-logic consulting

28 November 2003

Table of contents

1.   Introduction

The purpose of this progress report is to review and model the socio- economic considerations in natural forest protected area selection (Phase II of tasks 6.1, 6.2, 6.3 and 6.4 of the revised work plan for this project).

The report sets out the conceptual approach and the models used for the development of indices that will provide DWAF with decision support regarding the socio-economic trade-offs associated with forest protected area selection.

At the outset, it was realized that the process of prioritization and protected area classification needed to take place within the broader context of systematic protected area planning (see for example. Pressey et al 1993; Cowling, 1999; Cowling &. Pressey, 2003;; Margules & Pressey, 2000; Noss, 2003, Berliner & Benn 2003). This required a deeper and broader analysis than what was originally perceived. Importantly, the planning approach demanded a *national level* analysis of the relative conservation and biodiversity values of forest types and the threats faced by each forest. Within the context of South Africa, an additional important aspect to systematic protected area network design was needed. This required an assessment of the socio-economic trade offs associated with declaring an area as protected.

Biodiversity conservation is seen as a form of land use, often competing with alternative forms of land uses. Setting aside protected areas often results in the loss of opportunity cost for local populations who may be utilizing the forest resources within the area. However, the consequences of not acting to protect forest from over exploitation needs to be weighed up against the costs of complete forest resource degradation and the associated losses in the various forest values, that form the basis of this analysis.

Systematic protected area planning is an emerging science. It methodology is based on a systematic approach to protected area planning. This engages the complexity of interconnected socio- economic and environmental systems. It borrows from risk minimization strategies used in financial portfolio management, mathematical optimization and multi-criteria decision-making approaches.

Multi-criteria assessment is needed for effective planning and decision-making. This is likely to entail the processing of large and multiple data sets. This project has made use of the following computer tools C-Plan, GIS and Expert Systems, to facilitate information processing.

Responsibilities and management of state forest are currently in a state of flux in South Africa. Increasing demands are being made on indigenous forests to both continue providing products for subsistence use, and to provide commercially sustainable sources of timber and non timber forest products to assist in poverty alleviation strategies. Decision support is urgently needed to facilitate restructuring and realignment of the forestry sector with new policy directives.

Before informed decisions can be made regarding the future use or protection of forests three critically important areas of information are needed: a) the biodiversity conservation value of the forest, b) the threats faced by the forest, and c) the socio-economic values supplied by the forest.

This progress report describes the conceptualization and the methodologies used in assessing the socio-economic values of natural forest.

An indicator approach will be used to summaries large amounts of information and presents them in a form that can assist with decision making (refer to section 5 and Annex B)

2. Objectives

This progress report forms the conceptual development part of phase II of tasks 6.1, 6.2, 6.3 and 6.4 of the revised work plan for this project.

The focus of this progress report is the development of methods to assess the socio-economic values important to protected area planning.

The aim is to provide DWAF decision makers with decision support regarding relevant socio-economic trade -offs associated with selection and prioritization of protected forest areas.

This report discusses the context of the analysis, the methodologies, and models used to derive values for forest units.

Variables important for decision making are in the form of both 'primarily data' (using GIS data base e.g., forest size and type etc), or are' secondary data' (indices derived from expert system rules that use GIS data as primary input data)

It is intended that the results of this analysis will facilitate the process of identifying priorities areas where forest biodiversity conservation can be best implemented, while minimizing associated socio-economic trade off costs[1].

3. Approach

Three important conceptual tools have been used in this analysis, theses include a)' the forest valuation approach' used in resource economics and as described in Mayer 1997, and b) The 'ecological indicator approach' [2] and c) 'Occurs razor' (or the minimalist modeling approach).

Patton (1986) emphasis that forest evaluation should relate to specific objectives of a study and the circumstances of decision-making.' It is very important to identify who needs what information, under what conditions and for what purposes. This will also determine if qualitative rather than quantitative, or orders of magnitude instead of fine-tuned data are sufficient'. Data generation is usually costly and time-consuming. As Gregersen et al. (1995) pointed out, it is worth the time and effort to value things only if

---

[1] This will be presented in the progress report to follow.

[2] The indicator-based approach is increasingly used in environmental decision-making. It relies on expert knowledge and opinion to derive quantitative or qualitative indicators of environmental phenomena important to stakeholders

the values are going to be used effectively to accomplish something, for example, to influence a decision. There is no virtue in collecting more information than the minimum required to make reasonable decisions. This brings in the third conceptual tool used in this approach, that of *occurs razor*[3]

Because the level of analysis of this study is at a national scale, and with over 1400 forests, the analysis is out of necessity course filtered, involving the use of primary data, data surrogates, expert opinion and relative indices (and unavoidable there are assumptions).

The analysis does not attempt to determine *absolute values* of forest (this would be a time consuming, data hungry and complex task). Rather, the approach has been to employ a mix of quantitative and qualitative modeling techniques relying on expert opinion, rather than statistical analysis to derive 'rules of thumb describing hypothesized cause-effect dynamics. [4]

Qualitative modeling makes use of the best available information, be it expert opinion, literature reviews or hard data to derive relative values or indices. The function of indices is to make more effective use of available information and simplify in to a form more readily 'utilizable' for decision-making. This is particularly important in complex multi-criteria decision-making environments, (Manoliadis, 2002). Although subjectivity may be inherited in the development of an index, ultimately they need to be used to reduce subjectivity in environmental decision-making.

4.   Some problems with forest valuation

Understanding the various values of forest is an essential step toward informing policy and decision makers regarding forest resource planning, optimal use and biodiversity conservation. However, a number of problems are associated with this process and need to be considered. These are discussed below.

a) Measuring or estimating values is not the same as capturing them or making them reality. Values such as those for carbon sequestration may accrue to the global community but no one group can see them reflected in financial flows. For those who live near or in forests, a claim that their forests are generating enormous values while they themselves are gaining no cash, employment or other "real" benefits may not be easy to appreciate. Similarly, countries that set aside large areas of forest for environmental benefits may have difficulty defending their conservation decisions when they have to invest cash in return for the non-cash benefits.

b) There are many circumstances when the values of forests are not captured and remain only "potential" or "latent". There are other circumstances when values are captured through sale in the market and many other situations when the value is captured by people through direct use (e.g. by subsistence consumption). When value is captured through trade, it is not necessarily equal to that captured through direct use.

---

[3] Only including the simplest explanations using the least number of variables.
[4] Multivariate statistic would be ideally suited to this type of analysis. But more information would be needed on the response variables of forest resources (for example how forests respond to over harvesting),. Unfortunately it is unlikely that this information will become available for some time..

For example, certain non-wood forest products are essential for household food security during drought periods when other foods are scarce, under such conditions, the *value-in-use*, i.e. the true benefits brought to resource users, is much greater than the *value-in-exchange*, i.e. market value (Mayer 1997).

c) Decision-makers are unlikely to seriously take into account values estimated without showing how they can be captured. This is particularly true in developing countries with a day-to-day struggle to satisfy the most basic needs of their populations (notably food), cannot take a long-term view

d) The knowledge and understanding of forests ecosystems is still severely limited. There remains considerable uncertainty over the dynamics of forest ecosystems, rates of recruitment and growth, succession and effects of fragmentation. This makes regulation of quotas for sustainable harvesting levels difficult. Laws et al (200) feel that the sustainable use model so freely advocated remains to be tested and proven for forest resources in southern Africa. (also see Obiri, et al 2002).

e) Economics has one logic while the environment has another: the challenge is to find the way to make these logics compatible. This lack of information on such basic interaction parameters and values makes it difficult to select the dominant use or combination of uses that could yield the maximum social value for a particular tract of forest. Parallel to this ecological context, there is the "real world" context in which there are forces that influence the fate of forests and pressures for land use changes.

f) Laws et al (2000) list three main stumbling blocks to managing forest (and hence optimizing various use values) in southern Africa. These include:
- Institutional capacity to policy or control forest use is poorly developed or supported.
- Most forest products form part of a hidden economy and controls on market forces are negligible and difficult to implement.
- Untested and unknown levels of sustainable harvesting of most forest products

5.   Using indices to approximate forest values

Ecological indicators represent a numerical or a descriptive categorization of environmental data. Ecological assessments often rely on indicators to evaluate environmental conditions. An ecological indicator integrates discrete pieces of information representing condition of resources, magnitude of stresses, exposure of biological components to stress and related impacts and consequences.

Ecological indicators are useful tools in environmental assessment and decision-making. An environmental indicator is a distance measure from a goal or target against which aspects of policy performance should be assessed.Because the act of selecting goals and measuring indicators involves a human cognitive and cultural action of observing the environment in a particular way under certain premises and preferences, indicator information implicitly reflects the values of those who develop and select them. (Manoliadis,2002).

Chapter 40 of Agenda 21 (Agenda 21, 1992) calls for the development of indicators for sustainable development at multiple levels. Indicators are needed in order to provide

decision makers with information on sustainable development that is simpler and more readily understood than raw or even analyzed data . In particular, there is a need for highly aggregated and composite indicators, or indices which condensed information is assembled.

Since the Rio summit environmental indices have increasingly being used in environmental monitoring and decision support. The criteria and indicator process initiated by CIFOR, and adopted and developed by DWAF, provides a good example of this approach within the forestry sector (CIFOR, 1997). However, the use of indices of forest values to assist in protected area planning is a new approach, being initiated and explored by this project.

Indicators assist decision makers in reducing subjectivity and complexity, and importantly, enable informed decisions making, despite complex and often incomplete data sets.

Using an indicator approach to measure values has distinct advantages and disadvantages. Where information is incomplete, indicators can be derived using qualitative or semi-quantitative information (for example using surrogate data or qualitative 'expert opinion') . In this case values will be *relative* rather than *absolute.* The ability to use *relative values* reduces the need for large volumes of data and complex calculations using abstract valuation methodologies. The main disadvantage is that because such indices provide *relative magnitudes* of forest values, absolute values remain unknown. This limits the analysis to comparisons of the same types of values between different forests.. Comparisons across different forest value types is not possible (for example forests can be ranked or prioritized according to there relative subsistence use values, but indices of subsistence use values can not be rated against consumptive commercial values, as may be needed in a cost/benefit analysis type EIA's.

Because this study requires national scale data for all forest patches, some critical data is not available. This implies the need to use data surrogates and modeling. The challenge being to derive meaningful indices (i.e. *useful* within the context of the decisions that needs to be made) from existing spatially mapped data sources.

6.   The values of forest

Value is the worth of a product or service in a given context. Economic values are anthropocentric by nature, i.e. they are human-oriented and human-assigned. There are, however, non-anthropocentric values, for example, intrinsic values; these essentially deal with the inherent right of life forms to exist, independent of whether they are of use to humans.

Forests valued only as a source of timber are considerably undervalued. All too often financial value of commercial timber sales is the sole or predominant value reported. Value estimates often exclude the worth of forest functions in protecting biological diversity, water and soils; in capturing carbon; or in providing livelihood opportunities outside the formal monetary economy.

Forest provides different ecological and social functions. For example, to the people who live in or near forests, they mean a source of different materials, including food, as well as cultural identity. For others, they mean a source of timber and other products. For still

others, they have value in terms of recreation, biological conservation. Thus, proper valuation should be intended to provide a rational basis for directing funding into objectives to which society attaches importance.
.
Mayer (1997) classifies economic values associated with forests in four categories: (A) direct use values (including consumptive and non-consumptive use values); (B) indirect use values; (C) option values; and (D) existence and bequest values. These have been elaborated on in table1.

Table 1. Values associated with forest contributions to human welfare.

FOREST VALUE	TYPE	DESCRIPTION	APPROACH USED AND RELEVANCE TO THIS STUDY
A. Direct use values			
Consumptive	**Commercial**	Commercial timber extraction and, NTFP (ferns, hand crafts, honey, medicinal plants)	A compressive evaluation is beyond the scope for this study (but see proposed methodology in Annex A) Suggested Index could be derived using key commercial timber species, forest accessibility and regeneration potentials depending on forest grain). Value of NTFP difficult to determine.
	Subsistence	Non-market products: fuel wood, building materials animal products, foods and medicinal plants (food security).	Very difficult to determine directly. Indirect evaluation based on assumed dependence on forest resources by adjacent populations that have high levels of poverty. (Population resource use pressure index, see section 6.2)
Non-consumptive	**Tourism/recreation**	Income generation through eco-tourism. Recreation use value.	A full evaluation would be beyond the scope of this project. While tourism can provide important economic values to forest the contribution of this value should not directly influence protected area selection. (Could approximate this value by visitor numbers, the proximity of forest to tourist nodes, unique attributes of forest, scenic value, cultural sites etc). (see section 6.3)
	Cultural/spiritual/historical	Sacred sites, graves, places of worship, or areas of historical importance	An important consideration in protected area selection. Data used will be based on a study by Robert De Jong (National cultural museum) (see section 6.4)
	Science /education		Not directly applicable. Probably closely related to biodiversity value and uniqueness, difficult to model.(see section 6.5)
B. Indirect use			

	Landscape & ecological function	Watershed protection, Soil protection, nutrient recycling and soil fertility, contribution to climate stabilization and carbon storage	All forest play important roles in landscape ecosystem functioning, particularly in nutrient recycling, carbon sequestration and in water catchments. Forests occurring in headwater catchments areas of major rivers could be considered to have a particularly important ecological function. (see section 6.6)
	Biodiversity value	Forest provide essential habitat for many species	The most important forest value considered in protected area selection. Use 'irreplacability value' as an indicator of this. (Discussed elsewhere, not in this report)
C. Non use			
	Option values	People may value the option to use a forest in the future (e.g. for bio-prospecting)	Not applicable to this study
	Existence and bequest values	People may value a forest as a bequest to others or other generations.	Not applicable to this study

6.1   Commercial value of forest

6.1.1   Description

The consumptive commercial value of forest includes timber, and timber related products (pulpwood, poles) and commercial non timber forest products (NTFP) such as fruits, nuts, animals, fodder, medicines, crafts, reeds, ferns, medicines etc.

Timber harvesting has been one of the most important forms of economic utilization of indigenous forest in South Africa. In the past, over harvesting of timber has resulted in significant loss of forest habitat.

Currently there are only two areas, which produce harvestable indigenous timber from closed canopy forest: the Southern Cape forests of Knysna and Tsitsikamma, and the Amatola forests in the Eastern Cape. While other areas, in need of poverty relief, have the potential to provide significant income from sustainable timber harvesting, the problems associated with this form of utilization are manifold.(Durrheim & Vermeulen, 2003)

Values of non-timber forest products have the potential to make significant contributions to local economies, but biodiversity impacts of over harvesting and in appropriate management can be high.

Despite the potential contribution that NTFP can make to poverty alleviation there is little information on yields, productivity, markets, seasonality and management regimes. Data are also insufficient on potential yield of NTFPs. These products usually occur at extremely low densities and produce low yield per unit area. Uncertainties regarding reliability of crop yields and seasonality make marketing problematic.

6.1.2. HCV equivalent

Not directly applicable. (For a discussion on High Conservation Value Forests or HCV's, refer to annex C)

6.1.3 Approach adopted in this project

Discussions with experts on timber evaluation reveal that that there are many more variables that affect the commercial value of forest than described in Annex A . Prices differ depending on regions and demand, different species occurring in different forest types many of which may have a potential commercial value that has yet to be assessed. In addition commercial values of many timber and non-timber forest products are still in there infancy. While the methods proposed above are possible, they would be require time consuming analysis, and need data that may be currently unavailable (Theo Stehle, *pers. comms.*) [5]

When considered within the broader context of the projects objectives (to provide decision support for forest protected area prioritization), the commercial values of forest are not a critical consideration. Although useful to asses potential trade-off costs of setting aside an area for conservation rather than utilization, it is quite likely that if two areas have a similar irreplacability values, then consumptive timber values would also be similar (similar species compositions). Making any detailed analysis of commercial timber values largely redundant, at least for the purposes of this study.

Within the context of South African forests, protected area trade-off costs, are overshadowed by the dominance of subsistence resource use issues. For these reasons it has been decided that commercial timber values, are not within the scope of this study and will not be considered an essential selection variable for protected area prioritization.

6.2.   Consumptive subsistence value

6.2.1 Description

Subsistence values of forest are derived from non-market products such as fuel wood, building materials animal products, foods and medicinal plants. While the value of these products are not always that high in economic terms, they play an important role in providing food security, building materials for shelter and medicinal plant for primary healthy care of the rural poor.

The establishment of protected areas to promote biological conservation can imposed heavy opportunity costs on local people (Mayer 1997). This is particularly evident when protected area management regimes exclude access to subsistence resources. This is considered an important value within the context of this project and will receive high priority within this project.

6.2.2 HCV equivalent

HCV5. Forest areas fundamental to meeting basic needs of local communities.

---

[5] DWAF, Forestry Technical Services, Knysna.

The definition of HCVFs recognizes that some forests are essential to human well-being. This value is designed to protect the basic subsistence and security of local communities that are derived from forests - not only for "forest-dwelling communities", but also for any communities that get substantial and irreplaceable amounts of income, food or other benefits from the forest.

However, these HCVs do not include excessive extraction, even when communities are currently economically dependent on it. Nor do they include the excessive application of traditional practices, when these are degrading or destroying the forests and the other values present in the forest.

A forest may have HCV status if local communities obtain essential fuel, food, fodder, medicines, or building materials from the forest, without *readily available alternatives.*

Note that with the HCV approach, the following would not considered valid HCV5's:

• Forests providing resources that are useful but not fundamental to local communities.

• Forests that provide resources that could readily be obtained elsewhere or that could be replaced by substitutes.

It is felt that this argument may be questionable, given the high levels of poverty associated with forest in South Africa, limiting the options for resource substitution.

6.2.3   Approach adopted in this project

In the past the establishment of South African protected areas have often been associated with loss of heavy opportunity costs on local people who have been denied access to subsistence resources.

In South Africa some of the highest levels of poverty (compared to the South African averages) occur in association with forested areas (INR, 2003). This is discussed in more detail in section 8 under poverty and forest.

For this reason subsistence use value is considered the most important value in socio-economic trade–off analysis for protected are planning. This project has spent considerable effort in developing an innovative approach to deriving an index of the subsistence resource use value of a forest.

A direct calculation of subsistence value of each forest in South Africa would be very difficult. However an indirect, but nevertheless useful estimation of the relative importance of a forest in providing subsistence resources has been calculated, using the following assumption:

> *the degree of subsistence dependence on forest resources can be predicted from levels of poverty, population density of people associated with the forest, there proximity to and the degree of accessibility of the forest.*

These variables have been aggregated into a single index: the 'Subsistence *Resource use Pressure Index'*. Because the degree of dependence on forest resources would also

be proportional to the threat of over harvesting of subsistence resources, this index will also be used in forest threat assessment. (refer to figure 1)

The Subsistence *Resource use Pressure Index* requires the following assumptions to be made: a) subsistence resource use value is equated to the level of dependence on subsistence resources. b) The level of dependence on subsistence forest resources will increase with increased accessibility of the forest and with higher levels of poverty and population density per unit area of forest. The conceptual layout of the variables uses to calculate this index is illustrated in figure 1. (The method of scoring this index has been discussed in annex 2)

It needs to be pointed out that the presence of plantations and woodlots close to indigenous forest may serve to buffer the indigenous forest from some of the subsistence resource needs (such as fire wood and building materials). The addition of this data layer would improve the accuracy of the model but no comprehensive database of woodlots appears to be available yet and this refinement will have to be shelved for a future project.
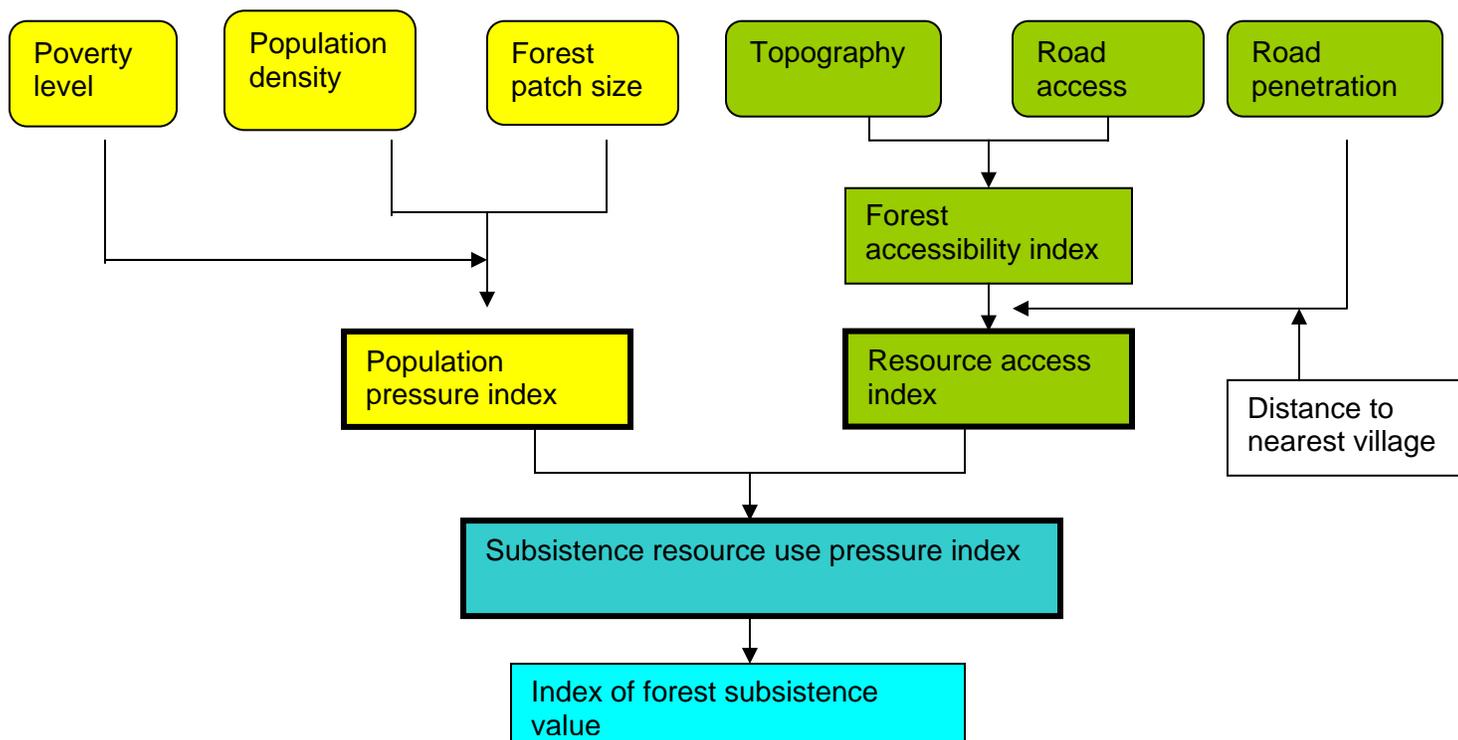

Figure 1. Deriving an index of the subsistence value of a forest. (Top row variables required GIS data input; the remaining variables are derived using expert system rules. (Distance to nearest village may be included pending availability of reliable data)

6.3.   Tourism/recreation value

The tourism and recreational value of a forest are seen as secondary considerations in protected area selection. However tourism can be important sources of income generation and employment that can effectively substitute the loss of access to subsistence resources often associated with protected areas.

Estimating the tourism value of the 1400 forest patches is a complex and time consuming task that falls outside the scope of this project's budget.

6.4 Cultural/spiritual/historical values

6.4.1 Description

Forests are closely associated with many different cultural and spiritual traditions all over the world. Individuals and communities often use forest-protected areas for spiritual reasons, because they inspire and heal them and/or provide them with a place for peace, education and communion with the natural world. Sacred places are revered and cared for by indigenous and traditional peoples and are often a fundamental part of their territories.

The importance and need for increase recognition of cultural/spiritual values of protected areas was key recommendation arising from the World Parks Congress, Durban, 2003.Speificaly the call was made " that all protected area systems, recognize and incorporate spiritual values of protected areas and culture-based approaches to conservation, and that international institutions, governments, protected area authorities, NGOs, churches, user and interest groups fully recognize and respect the rights in relation to conservation activities". WPC Recommendation 5.13: Cultural and Spiritual Values of Protected Areas. World parks congress, 2003, Durban: Benefits beyond boundaries)

Of particular relevance to this project was the request made during the WPC that the IUCN review the 1994 Protected Area Category Guidelines with the aim of including these values as additional potential management objectives in categories where they are currently excluded.

Recommendations made at the IUCN World Parks Congress 2003, regarding protected areas and cultural/spiritual values have been summarized in box 2, below.

Box 2. Important recommendations made at the IUCN World Parks Congress 2003, regarding protected areas and cultural/spiritual values.

ACKNOWLEDGE indigenous people internationally guaranteed rights to, among others, own and control their sacred places, their archaeological and cultural heritage, ceremonial objects and human remains contained in museums or collections within or adjacent to protected areas. These include the following rights to:
a. DEFINE and name their sacred places and objects,
ancestral remains and archaeological, cultural and intellectual
heritage and to have such designations respected as
authoritative;
b. Where relevant, MAINTAIN secrecy about and enjoy
privacy in relation to their heritage, objects, remains and places
as described above;
c. RESTITUTION of sacred places, heritage, objects and
remains taken without their free and informed consent;
d. FREELY EXERCISE their ceremonies, religious and
spiritual practices in the manner to which they are accustomed;
e. GATHER, collect or harvest flora, fauna and other
natural resources used in ceremonies and practices that take
place at sacred places or archaeological and cultural heritage
places; and
f. MAINTAIN their responsibilities to their ancestors and
future generations;

6.4.2   HCV equivalent

HCV6. Forest areas critical to local communities' traditional cultural identity.

This value is designed to protect the traditional culture of local communities where the forest is critical to their identity, thereby helping to maintain the cultural integrity of the community.

A forest may be designated a HCV6 if it contains or provides values without which a local community would suffer a drastic cultural change and for which the community has no alternative. Examples of HCVF under this part of the definition may include forest with sacred burial ground used as places of worship and ceremony.

6.4.3   Approach adopted in this project

Access rights to traditional cultural/ spiritual areas need to be respected irrespective of the protected area status. A registrar of forest cultural/historical sites needs to be drawn up DWAF. (See the' De Jong list'). Where information has been made available to this project it will be considered in the selection of protected area categories.
Some form of classification of Cultural/spiritual and historical sites type is needed to assist with assigning an appropriate management classification. The incorporation of this important variable in forest protected area planning is largely dependent on the quality an detail of data provided by DWAF.

Cultural/spiritual and historical sites can also provide important motivation and interest to the tourism industry.

6.5   Science and education value

The scientific and educational value of forest is subjective, but can be assumed to involve all values discussed. This will not form part of this project analysis.

6.6   Landscape- ecological function value

6.6.1   Description

These are particularly important values of forest that remain to be adequately incorporated into environmental evaluation. It entails watershed protection, soil protection, nutrient recycling, soil fertility, and contribution to climate stabilization and carbon storage. In this regard all forest are important. Placing economic value on this ecosystem function is particularly difficult, but is receiving increased attention by resource economists. This value is often only realized when forest have been cleared, resulting in increased flooding, dam sedimentation and reduced dry season water flows

The loss of forest cover and conversion to other land uses can adversely affect freshwater supplies and compound human disasters.

One of the key ecological values of forest relate to their hydrological functions. Forested watersheds are exceptionally stable hydrological systems. In contrast to other land uses, healthy forests:

- strongly influence the quantity of water yielded from watersheds;
- discharge the highest quality of water;
- discharge lower storm flow peaks and volumes for a given input of rainfall;
- moderate variation in stream flow between the high and low flows during a year;
- provide the greatest soil stability and the lowest levels of soil mass movement, gully erosion and surface erosion;
- export the lowest levels of sediment downstream. (State of the World's Forests, 2003)

Forests are particularly important in upstream-down stream linkages. This watershed perspective can help to provide clarity in determining the economic value of forests. However, no comprehensive economic analyses that consider the full range of these benefits have so far been made, because of a number of difficulties, including the problem of placing an accurate value on many services, particularly water flow, sediment loads and pollutants. Because these services are not traded in the marketplace, and in many parts of the world, water is heavily subsidized and often considered a free good, economic evaluation is difficult. (State of the world forest 2003),

6.6.2   HCV equivalent

Jennings & Jarvie (2003) provide the following classification of landscape-ecological values: with the HCV framework :

HCV4. Forest areas that provide basic services of nature in critical situations.
*   HCV4.1 Unique sources of drinking water*
*   HCV4.2 Forests critical to water catchments*
*   HCV4.3 Forests critical to erosion control*
*   HCV4.4 Forests providing barriers to destructive fire*

6.6.3   Approach adopted in this project

The question that needs to be asked within the context of this project is: can forest with exceptionally high landscape- ecological functions be identified using national scale analysis, and should this be a criteria used in protected area categorization, selection and prioritization?

The short answer is yes, certain forest may have more important landscape-ecological functions than others, this is likely to depend on their location, size and position within a catchments basin. For example, a forest that forms a large proportion of the catchment area of a river that has a high risk of damaging and destructive flooding downstream may be critical in preventing flooding. The greater the importance of the water catchments, in terms of flooding or drought risk or water usage, the more likely it is that the services provided by the forest are critical, and should be considered as a high conservation value (HCV) forest. (Jennings & Jarvie ,2003)

It is understood that a detailed analysis and prioritization of the landscape-ecological functions of South Africa forest would be an important study, however this would be beyond the scope and resources of this project. In respect of the selection of priority conservation areas, forest occurring at the head waters of particularly important catchment basins could be tentatively identified, however a more detailed regionally based study would be needed to adequately address this important topic.

6.7 Biodiversity value

6.7.1 Description

This has been discussed in previous progress reports of this project.[6]

6.7.1 HCV approach

HCV2. Globally, regionally or nationally significant large landscape level forests

This part of the HCVF definition aims to identify those forests that contain viable populations of most if not all naturally occurring species.

HCV3. Rare, threatened or endangered ecosystems

This value is designed to ensure that threatened or endangered forest ecosystems, communities or types are maintained. These include forest types which were previously widespread or typical of large regions. They also include rare associations of species, even when the constituent species may be widespread and secure.

6.7.3 Approach adopted in this study

This is a key value in protected area selection. The irreplacability value of a forest, calculated using C-Plan will serve as an index of its biodiversity value. This has been discussed in great detail elsewhere in this study. (see Berliner & Benn 2003)

6.8. Non use values

Option and existence value are abstract concepts that do not form part of this study

7 Poverty and forest protected areas

7.1 Description

In South Africa poor households are mainly concentrated in the former homeland areas, particularly rural areas. Seventy-four percent of the poor live in rural areas. The Eastern Cape and Limpopo Provinces are reported to be the two poorest regions (INR, 2003).

Many regions where natural forest and plantation occur, include areas with some of the highest levels of poverty, when compared to the South African averages. Areas with high levels of poverty despite the presence of forests, plantations and their associated economic activities have been termed as "hotspot" areas and are highlighted in figure 1, below.
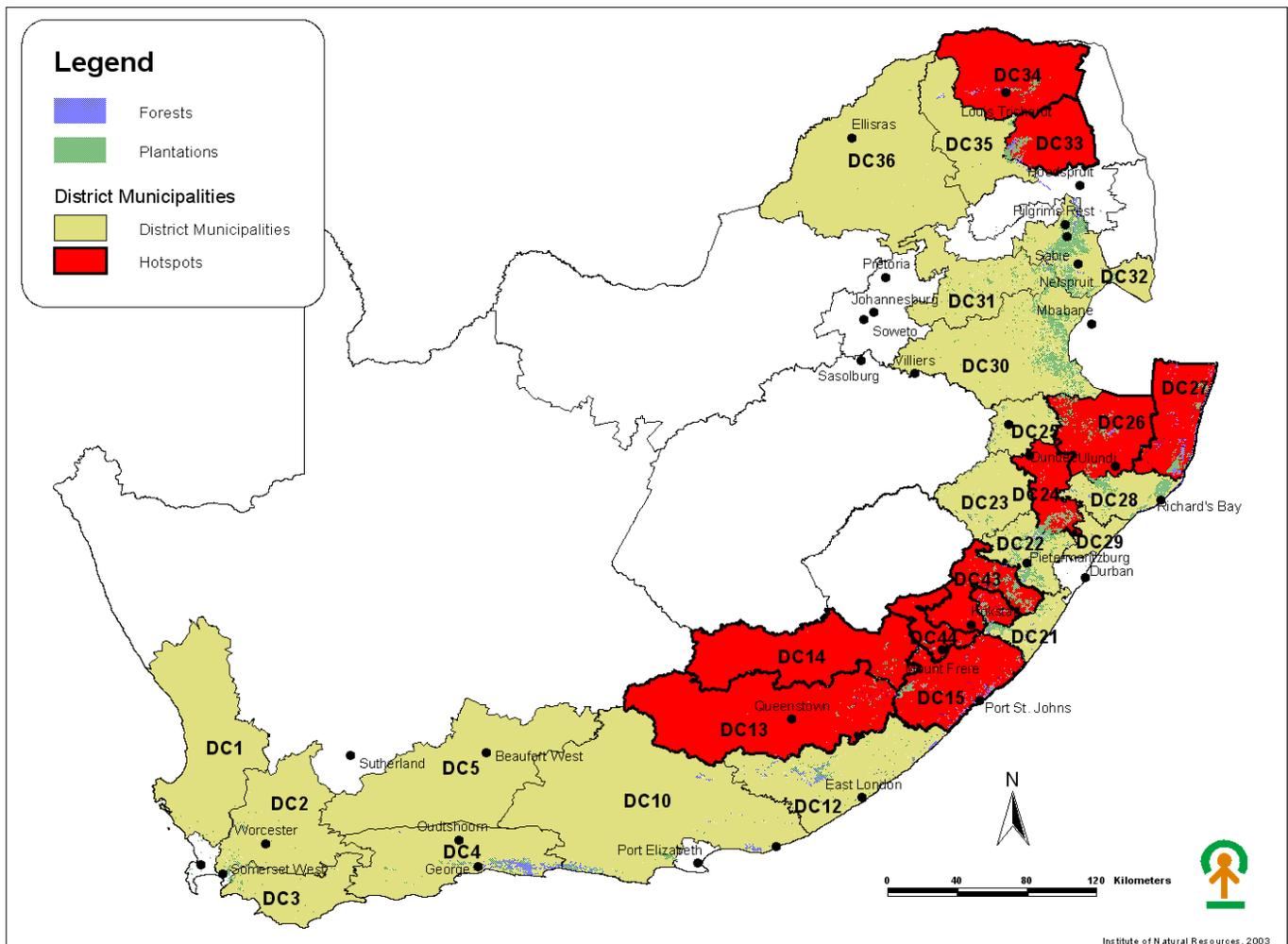
---

[6] See Berliner & Benn (2003)

Figure 2: Location of District Municipalities 'forestry /poverty hotspots': areas with significant natural forest and plantations that have particularly high poverty levels. (INR, 2003).

7.2   Forest and poverty alleviation

Forests can be vital safety nets, helping rural people to avoid, mitigate or rise out of poverty This function is unknown to many policy-makers and planners because it is not well understood or explained. One reason is that the contribution of forests to poor households is largely unrecorded in national statistics, as most of it is for subsistence or for trade on local markets. In addition, most wealth from timber goes to better off Segments of society, are used either to avoid or to mitigate poverty, and situations in which they are used to eliminate poverty.

Forest-based poverty alleviation cannot be carried out in isolation. It tends to be linked to other land uses, in particular agriculture, grazing and mixed systems of crop and tree growing. There are three main ways of achieving forest based poverty alleviation: preventing forest resources from shrinking if they are necessary for maintaining well-being; making forests accessible and redistributing resources and rents; and increasing the value of forest production (State of the World Forest, 2003, FAO).

7.3 Poverty and protected areas

Protected areas cannot be viewed as islands of conservation, divorced from the social and economic context within which they are located. Poverty, displacement, hunger and land degradation have a profound impact on bio-diversity and protected areas, and pose a very serious threat to their survival. Poverty is multidimensional (lack of assets / opportunities, vulnerability, and lack of power or voice), and protected areas have a powerful potential to make a significant contribution to poverty reduction

Protected areas can generate significant economic, environmental and social benefits. Usually a disproportionate amount of the costs of protected areas are borne locally. As with other forms of large-scale land use, many local communities have been marginalized and excluded from protected areas. Given that their natural and cultural wealth often constitutes an important asset for local communities, denying rights to these resources can exacerbate poverty. Protected Area establishment and management cannot be allowed to exacerbate poverty.

New ways of working with local communities to act as custodians of biodiversity through working with Protected Area authorities, and to build their ability to manage their own areas are needed.

Increasing the benefits of protected areas and reducing their costs to local people can help mobilize public support and reduce conflicts and the enforcement costs of Protected Area management, particularly in areas of widespread poverty.

There is a need for strengthening existing and developing new financial mechanisms that can provide fair reward for stewardship of nationally and globally important biological resources. The convergence of the poverty reduction and Protected Area agendas represents a real opportunity to generate new and additional resources for conservation (WPC, 2003 recommendation 29).

Box 3: World Parks Congress, 2003. Recommendation 29: Poverty and protected area: Principles on the linkage between protected areas and poverty: (summarized extract)

a) In order to achieve their potential both to conserve biodiversity and to assist in reducing poverty, protected areas should be integrated within a broad sustainable development planning agenda.

b) Protected areas should strive to contribute to poverty reduction at the local level, and at the very minimum must not contribute to or exacerbate poverty.

c) Biodiversity should be conserved both for its value as a local livelihoods resource and as a national and global public good. Equitable sharing of costs and benefits of protected areas should be ensured at local, national and global levels.

d) Where negative social, cultural and economic impacts occur, affected communities should be fairly and fully compensated.

e) A gender perspective should be incorporated that encompasses the different roles of women and men in livelihood dynamics,

7.4   Approach adopted in this study

This report has addressed the key socio-economic implications of protected areas categorization. This is specifically in regard to the potential of reducing resource use rights and thereby exacerbating poverty, but also the potential of protected areas to contribute towards alleviating poverty (through tourism, job creation and attracting donor funding for example) . In this regard this study will enable the following contributions to be made:

- Map the occurrence of poverty in relation to the occurrence of natural forests (This will be at a higher level of detail than the INR study and will focus only on natural forest)

- Map the occurrence of forest with high irreplacability (conservation value) in relation to poverty hotspots. These will be considered as 'critical hotspots'

- Map the occurrence of forest with high threat in relation to poverty hotspots

References

Agenda 21, 1992. Agenda21, Programme of Action for Sustainable Development. United Nations Publications, New York.

Berliner, D & Benn, G. 2003. Conservation planning and target setting: Best Practice Review. Prepared for DWAF, Supported by DFID. March 2003..

Berliner, D.2003 Progress report: protected area system planning for natural forests: using GIS and expert systems to model forest threats. Report for DWAF. 11 November 2003.

CIFOR . 1997 . Criteria and Indicators for Assessing the Sustainability of Forest Management:Conservation of Biodiversity. *N.E. Stork, T.J.B. Boyle, V. Dale, H. Eeley, B. Finegan, M. Lawes, N. Manokaran, R. Prabhu and J. Soberon. Woking paper no 17.*

Cowling, R.M. 1999. Planning for persistence – systematic reserve design in southern Africa's Succulent Karoo desert. *PARKS* 9(1): 17-30.

Durrheim G.P. & Vermeulen W.J. 2003. Regional Indigenous Forest management Plan for the Southern Cape and Tsistikamma. Scientific services: Indigenous Forest Management Department of Water Affairs and Forestry.

Everard, D.A., Midgley, J.J., Van Wyk, G.F., 1995. Dynamics of some forests in KwaZulu-Natal, South Africa, based on ordinations and size class distributions. S. Afr. J. Bot. 61 (6),283–292.

Gregersen, H.M., Arnold, J.E.M., Lundgren, A.L. and Contreras-Hermosilla, A. 1995. Valuing forests: Context, issues and guidelines. *FAO Forestry Paper 127*. Rome: Food and Agriculture Organization of the United Nations (FAO).

IUCN World Parks Congress, 2003. Recommendation 13: Cultural and Spiritual Values of Protected Areas.

IUCN World Parks Congress, 2003. Recommendation 29: Poverty and Protected Areas.

Pressey, R.L. 2003. Introduction to systematic conservation planning in the Cape Floristic Region : Editorial. Biological Conservation 112 (2003) 1–13.

Jennings S.& J. Jarvie 2003. A Sourcebook for Landscape Analysis of High Conservation Value Forests.Version . Proforest. 1.58 St Aldates .Oxford OX1 1ST United Kingdom. E mail info@proforest.net Website www.proforest.net

INR 2003. A review of poverty in relation to forest based opportunities. Fonda Lewis, F., Blanché C. & Todd, M. 2003.February 2003. Institute of Natural Resources. Prepared for DWAF WFSP Forestry Programme. (DFID).

Margules, C.R. & Pressey, R.L. 2000. Systematic conservation planning. *Nature* 405: 243-253

Manoliadis, O.G. 2002. Development of ecological indicators: a methodological framework using compromise programming. Ecological Indicators 2 (2002) 169–176
Mayer A 1997. Forest valuation for decision making : lessons of experience and proposals for improvement. Food and Agriculture Organization of the United Nations. Rome

Noss, R.F., Carroll, C., Vance-Borland, K., Wuerthner, G., 2002. A multicriteria assessment of the irreplaceability and vulnerability of sites in the Greater Yellowstone Ecosystem. Conservation Biology16, 895–908.

Obiri, J., Lawes, M., Mukolwe M. 2002.The dynamics and sustainable use of high-value tree species of the coastal Pondoland forests of the Eastern Cape Province, South Africa. Forest Ecology and Management 166 131–148

Patton, M.Q. 1986. Utilization-focused evaluation. Second Edition. London: Sage Publications

State of the World's Forests 2003. FAO Forestry Department . FAO . Rome

Stehle, T.2003. Personal communication. Forestry Technical Services. Private Bag / Privaatsak X12 Knysna 6570

ANNEX A: Deriving an index of consumptive commercial value of forests

Timber harvesting has been one of the most important forms of economic utilization of forest. Apart from the southern Cape forest, relatively little work has been done on calculating the commercial timber value of different indigenous forest types.

Nine species are regularly harvested in the southern Cape forest (see table 1).

These species have been used to develop an index of the potential consumptive commercial value of Southern Cape indigenous forests.

An index of the potential timber value for each important timber species can be calculated by combining the scaled values[7] of timber yield and average price. This is done by applying the scaling rule of (x-minimum value)/(maximum value-minimum value) * 10

[Index of timber value per *species*] = ([scaled value: volume /tree harvested] + [scaled value: price/m^2])/2

The index of the potential timber value of a forest is given by:

[Index of timber value per *forest*] = SUM of ([Index of timber value per *species*] X [abundance index   per species])

Table 1. Nine of the economically most important timber species harvested from indigenous forest with an index of timber value (primary data derived from Durrheim G.P. & Vermeulen W.J. 2003; Stehler, pers comms)

Species	Average utilizable volume per tree marked for harvesting (m3)	scaling out of ten	Average price per cubic meter	scaling out of ten	Combined value index (value out of ten)
Ocotea bullata	1.016	4.9	2995.79	10.0	7.5
Podocarpus latifolius	1.061	5.3	1818.34	5.0	5.1
P. falcatus	1.669	10.0	1538.14	3.8	6.9
Oleacapensis ssp. macrocarpa	0.902	4.0	1182.74	2.3	3.2
Olinia ventosa r	0.973	4.6	2067.48	6.1	5.3
Platylophus trifoliatus	0.492	0.8	1087.57	1.9	1.4
Apodytes dimidiata	0.453	0.5	870.26	1.0	0.7
Pterocelastrus tricuspidatus	0.527	1.1	1234.62	2.5	1.8
Curtisia dentata	0.387	0.1	638.63	0.1	0.1
Acacia melanoxylon	0.826	3.4	1736.88	4.7	4.0

A.1   Adjusting the timber value index for 'forest accessibility'

A forest that is inaccessible will effectively have a timber value of zero,

---

[7] For details on scaling , refer to Annex B of this report.

The accessibility index is derived from the topographical position of the forest and the road access. This has been discussed under the *analysis of forest threats report* of this project.

Accessibility adjusted timber value is derived by:

[Forest timber value index] X [accessibility index]

A.2 Incorporating species regeneration and forest grain

Potential commercial value of a forest would depend not only on the type of species and there timber value, but also on there regeneration potential and type of harvesting system used. The regeneration potential needs to be considered at both species level (growth rated of selected species) and at ecosystem scale (post harvest succession recovery scale). The concept of spatial grain (e.g. Everard et al., 1995) provides insight into the later process.

Obiri et.al. 2002 combine a traditional analysis of population on size-class frequency distributions (SCD) with a further analysis of the apparent spatial grain of population regeneration from these same static data. (see figure 3) This approach allows an estimate of what tree species can potentially sustain moderate harvesting levels, and further identify those species that should not be used. While these data do not permit an estimate of absolute optimal harvesting limits, used judiciously they do provide a useful framework upon which to base operational harvesting rates.. Provided data availability to do this calculation, this approach could be used to derive a index of the regeneration potential of species within a forest and be used in determining an index of the potential commercial value of forest.
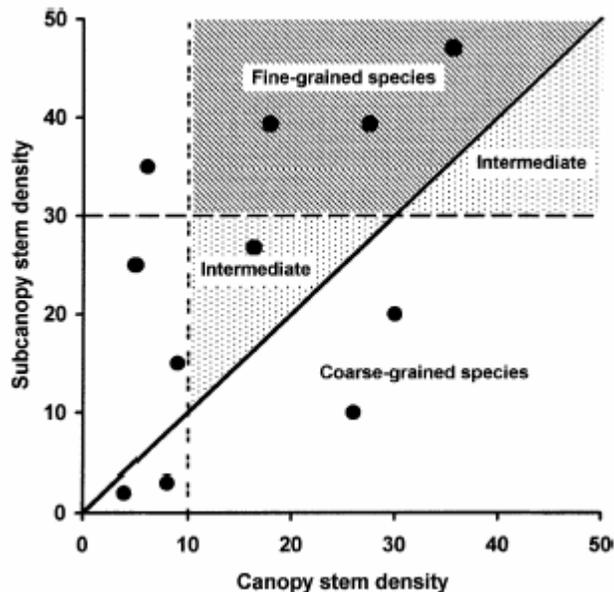

Fig. A1 Theoretical representation of the spatial scale or grain of regeneration of tree species. Stem density (individuals/ ha) of sub-canopy/understory stems (dbh = 5 to 20 cm) are plotted against the canopy stem density. In fine-grained species sub-canopy and canopy individuals are well represented over a small area. Dashed lines represent lower harvesting limits for sub-canopy and canopy tree densities. (Obiri et.al. 2002)

ANNEX B: Scaling and normalization of indicators

Scaling or normalization is need for two reasons; firstly to measure the distance from a predefined goal or target (so that aspects of policy performance can be assessed), and secondly for aggregation of more than one indicator into a single measurement. (Also see Manoliadis, for the compromised programming approach to using indicators in multi-criteria decision support 2003)

Typically, where large numbers of indicators are used (as in environmental monitoring and decision making) there is a need to simplify and aggregate into compounded indices (for example indices of sustainability). Because indicators may measure completely different things, combining them is like combining apples and oranges. Before combining indicators, a common unit is needed. A performance scale measures how good an orange is at being an orange and how good an apple is as an apple. "Best" or "good" is defined at one end of the scale, and "worst" or "bad" at the other end. The position of the indicator can then be plotted on the resulting scale. Upper and lower limits are defined according to best available/worst available values. These upper and lower limits may be derived from international standards, local research, or stakeholder value judgments, depending on availability of data. Benchmarks and target values can also be used as upper values.

The scale can be uncontrolled, or controlled. In an uncontrolled scale, only the two end points are defined and the intervals between them are equal. For controlled scaling, whether an indicator reading falls into a qualitative value judgment of good, acceptable, medium, poor or bad, is pre determined by the end points of the scale, ie the evaluation scale is set by user assumptions of what is good or bad or acceptable This is known as controlled scaling. An uncontrolled scale assumes a linear scale relationship.

In partially or fully controlled scales, the good and acceptable classification may include a narrower or a wider range of performance than the other sectors. In a controlled scale judgment classifications of good, bad or acceptable, are set before and will not be a linear scale between best and worst values. This is particularly important when there may be thresholds of acceptability or non-acceptability.

When the scale is uncontrolled, the indicator reading is plotted on the scale, using the standard rule:

If best is the maximum value and worst the minimum**:**
([Actual minus minimum] divided by [maximum minus minimum]) multiplied by 100.

Or, if best is the minimum value and worst the maximum:
([Actual minus minimum] divided by [maximum minus minimum] subtracted from 1) multiplied by 100.

In uncontrolled scaling the evaluation of performance as good, acceptable, or bad is evenly distributed across the scale. With controlled scaling evaluation, performances will not be unevenly distributed across the scale and will depend on predefined thresholds or acceptability standards.

For example, if we want to derive an index of the value of a forest to substance resource users. Firstly we have identified a number of indicators (see figure) including forest size, surrounding population number, distance to forest and forest accessibility. The relative resource quantity is measured by the numbers of people per unit are area of forest. This 'pressure index' is derived from actual values of population and forest size. But before we can modify this indicator to include other factors such as accessibility we need to scale the values as a score out of ten

ANNEX C: Forestry Stewardship Counsel's 'High Conservation Value Forest'

C.1   What are High Conservation Value Forests?

The concept of High Conservation Value Forests (HCVFs) is a new approach to ensure that the most important forest values are considered and managed in the context of Forest Stewardship Council (FSC) certification.

The key to the concept of HCVFs is the identification and maintenance of High Conservation Values (HCVs). The FSC's definition of HCVs encompasses exceptional or critical ecological attributes, ecosystem services and social functions.

A High Conservation Value Forest is the area of forest required to maintain or enhance a High Conservation Value. An important implication of this definition is that management (e.g. harvesting) is not automatically precluded in HCVFs. However, any management that does take place must be compatible with maintaining or enhancing the identified HCV. (Jennings.& Jarvie, 2003)

The first column in table2 lists the six main HCV types.

C.2   HCV's and the 'systematic protected area-planning approach'

There are similarities in the two approaches, and ideally they should complement one another. However the objectives of each differ slightly. Systematic protected area planning provides a methodology to identify and prioritizes a protected area network that will ensure representivity and persistence of region or countries biodiversity. HCVF's identify and create an awareness of the different forest values and the importance to maintain them within a management regime and certification system. The scale of analysis is higher , with HCVFs designed to be done at the FMU level by individual forest managers seeking FSC certification. Systematic protected area planning is typically done at the national or regional level and requires setting and optimizing for specific conservation targets.

Despite HCF's being aimed at the FMU level, the process enables a broader perspective on some forest values. Benefits for individual forest managers include: clear information about what HCVs are present, or are likely to be present, within their forest management units; clarification of the context of HCVs relative to a wider spatial context. (reference to a wider context is often needed to know whether habitats or forest types are unique or threatened; data on HCVs that are only meaningful on scales that are greater than the typical forest management unit).

HCVs also provide a more detail brake down of some of the biodiversity and socio-economic values of forest than what is possible with national scale analysis. While this is particularly useful for finer scale management planning in creating awareness of these values, and ensuring the management for there persistence, the level of detail is inappropriate for national level protected area network planning.

By way of a critique: most of the HCV values are overlapping or nested, implying a degree of redundancy and unnecessary detail. The point being that provided the large-

scale process related values are maintained, conservation of the finer scale values will be ensured. Take for example the values listed in box 2. These values are interrelated and 'nested' and often inseparable from one another.

Box C1. Example of 'nested' forest values

HCV4. Forest areas that provide basic services of nature in critical situations.

HCV4.1 Unique sources of drinking water

HCV4.2 Forests critical to water catchments

HCV4.3 Forests critical to erosion control

HCV4.4 Forests providing barriers to destructive fire

HCV4.5 Forests with critical impact on agriculture or fisheries

---

Table 1 provides a list of the six main HCV's and the equivalent with in the context of this project.

Table 1 Integration of FSC 's High Conservation Value Forest' approach with systematic protected area approach used in the project

High Conservation Value type	International examples	Systematic PA planning equivalent[8] (as used in project)
HCV1. *Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia).*	Several globally threatened bird species together in a Kenyan montane forest	Accounted for in biodiversity pattern targets
HCV2. *Forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring*	e.g. a large tract of Mesoamerican lowland rainforest with healthy populations of jaguars, tapirs, harpy eagles and caiman and most smaller species	Biodiversity pattern & process targets (specifically landscape level processes necessary for persistence)

---

[8] Systematic protected area planning is (arguably) an emerging science, based on a systematic approach to protect area planning, This entails a both a systems view of the interconnected socio- economic and environmental systems, but also a ' portfolio management approach' to the optimization of biodiversity conservation goals.

species exist in natural patterns of distribution and abundance.		
HCV3. Forest areas that are in or contain rare, threatened or endangered ecosystems.	e.g. patches of a regionally rare class of freshwater swamp forest in an Australian coastal district	Biodiversity pattern targets
HCV4. Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control).	e.g. forest on steep slopes with avalanche risk above a town in the European Alps	'Landscape and ecological value of forests'.(Forest that are particularly important to watershed head waters)
HCV5. Forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health).	e.g. key hunting or foraging areas for communities living at subsistence level in a Cambodian lowland forest mosaic	Subsistence value (modeled using forest population pressure as a surrogate indicator of level of resource dependency on the forest)
HCV6. Forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).	e.g. sacred burial grounds within a forest management area in Canada	Socio-cultural value (where data available listed for site specific analysis)