

Integration of Biodiversity into National Forest Planning Programmes

The Case of South Africa

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INTRODUCTION

South Africa is in general a dry country, where the vegetation cover is determined by its low mean annual rainfall. As a result most of the country is covered by dry savanna woodland or woodland scrub. Midgley *et al* (1997) define forests as being closed-canopy plant communities comprising mainly woody plants more than 5m tall and maintain that within this definition patches of forest occur within almost all southern African biomes. Most natural evergreen forests are found in areas of higher rainfall, however, in a narrow broken belt along the southern and eastern seaboard, and in the country's mountainous regions towards the eastern borders with Swaziland and Mozambique (Figure1) (Low and Rebelo, 1996). Estimates of the area covered by closed canopy forests vary between 0.25% (Low and Rebelo, 1996) and 0.59% of the land surface (DEAT, 1997) while savanna woodlands and plantations make up between 35 and 40%, and 1.4% respectively (Shackleton and Mander, 2000; Owen and van der Zel, 2000). There are approximately 420,000 ha of indigenous closed forest (about 300 000 ha enclosed in protected areas), 32-40 million ha woodlands; and 1.5 million ha of plantation forests.

The natural vegetation of South Africa can be divided into the following biomes (Low and Rebelo, 1996):

Forest Biome

This comprises indigenous forests and excludes plantations. The canopy cover is continuous, comprising mostly evergreen trees, and beneath it the vegetation is multi-layered. Herbaceous plants, particularly ferns, are common only in the montane forests, whereas lianas and epiphytes are common throughout. The ground cover is almost absent due to dense shade.

Thicket Biome

No formal 'thicket biome' is recognised in the scientific literature. However it is a useful classification for transitional vegetation types between 'Forest' and 'Savanna'. Subtropical thicket is closed shrubland to low forest dominated by evergreen, sclerophyllous or succulent trees, shrubs and vines, many of which have stem spines. It is almost impenetrable, is generally not divided into strata, and has little herbaceous cover.

Savanna Biome

The savanna biome is characterised by a grassy ground layer and a distinct upper layer of woody plants. Where this upper layer is near the ground, the vegetation may be referred to as Shrubveld. Where it is dense it is known as Woodland, and the intermediate stages are known locally as Bushveld.

Grassland Biome

Grasslands (also known locally as Grassveld) are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. Trees are absent, except in a few localised habitats. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

Nama Karoo Biome

The dominant vegetation in the Nama Karoo is a grassy, dwarf shrubland. Grazing rapidly increases the relative abundance of shrubs. Most of the grasses and shrubs are deciduous in response to rainfall events.

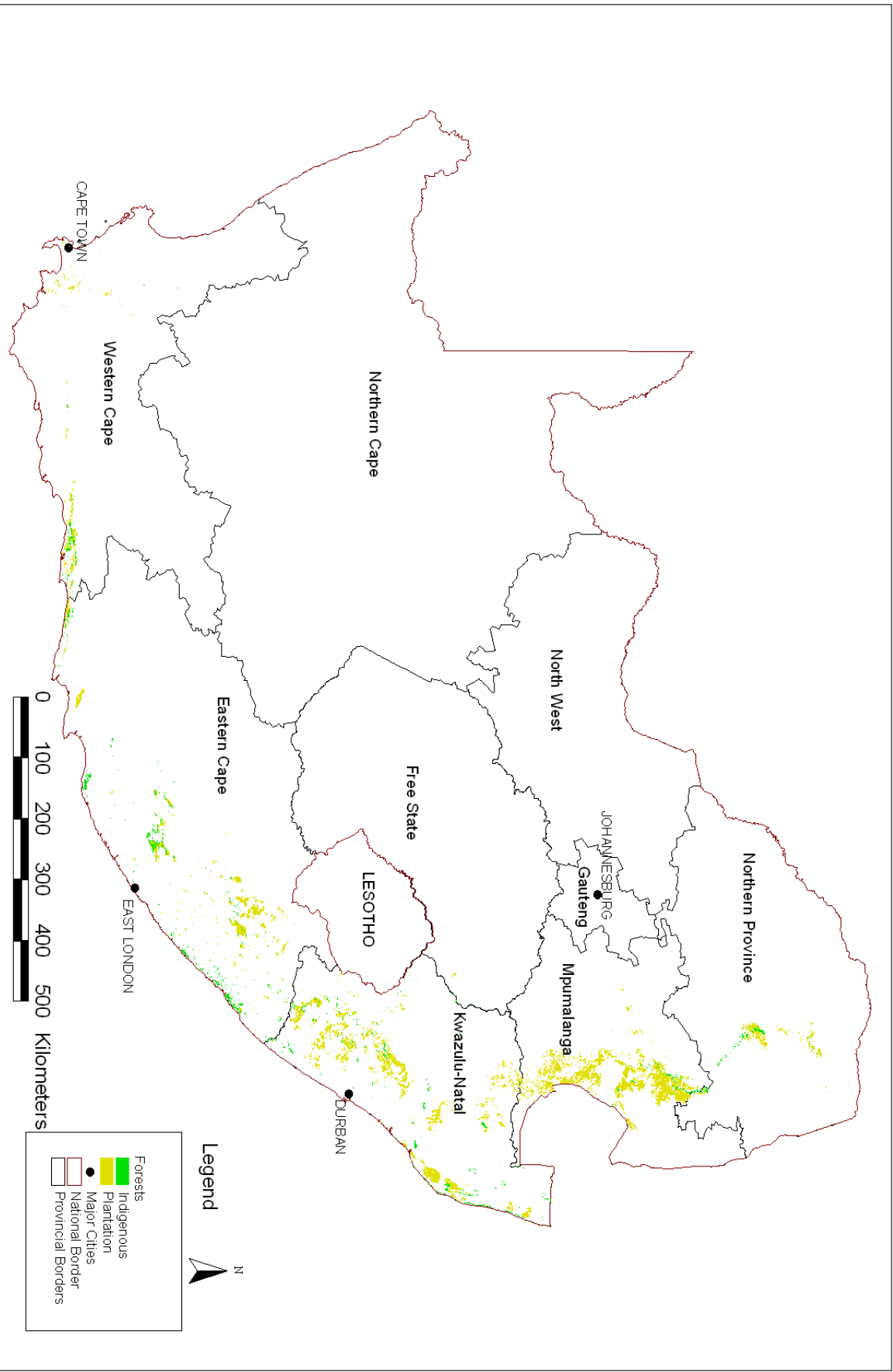


Fig. 1. Distribution of natural forests and plantations in South Africa (van der Zel, 1988)

Succulent Karoo Biome

The vegetation of this biome is dominated by dwarf succulent shrubs and mass flowering displays of annuals occur in spring, often on degraded or fallow lands. The number of plant species – mostly succulents – is very high and is unparalleled elsewhere in the world in arid areas of this size.

Fynbos biome

The fynbos biome is dominated by fine-leaved woody shrubs typical of a Mediterranean-type vegetation of winter rainfall, and can be considered as essentially synonymous with the Cape Floral Kingdom. This biome is characterised by high species richness and endemism.

OVERVIEW OF PRESENT STATE OF NATIONAL FOREST MANAGEMENT IN THE COUNTRY

1.1 History of forest management in South Africa

The early history of the closed canopy forests, up until the end of the 19th century, was one of heavy exploitation (Owen and van der Zel, 2000) as hardwoods were cut for wagon making and housing, followed latterly by railway sleepers. As a result, the then governor, van Riebeeck, promulgated a number of *placaaten* or legislative measures shortly after colonisation, to protect gardens, lands and trees from destruction. The first officially protected areas in South Africa were the forest reserves of Knysna and Tsitsikamma in the southern Cape, proclaimed in terms of the Cape Forest Act of 1888. This was followed by the establishment of forest services in Natal in 1891, and in the Orange Free State and Transvaal by 1903 (Rabie and Fuggle, 1992).

Forest management in South Africa reflects the country's apartheid history and the colonial tendency for line management within government departments. In the recent past, in both former 'white' and 'Homeland' areas, government efforts were focussed on conserving the closed canopy forests, while encouraging a thriving forest industry based on planted resources (Owen and van der Zel, 2000). However, indigenous forest management in the former 'Homelands' came under a conservation regime that was plagued by lack of effective management and ignored the local communities' need for natural resources to sustain their livelihoods. At the same time, the indigenous forests of the southern Cape came to be some of the best managed natural forests in the world. The woodlands, most of which fell on game reserves, private farms or the forgotten communal lands, were considered the domain of ecologists, extensionists and wildlife managers.

Because most of the indigenous species are slow-growing and unsuited to plantations, exotic species were introduced from Australia to provide more timber supplies. Black wattle (*Acacia mearnsii*) and various *Eucalyptus* species were planted with encouraging success, and soon there were thriving wattle plantations for the production of tan-bark (Owen and van der Zel, 2000). Port Jackson bush (*Acacia saligna*) and Rooikrans (*A. cyclops*) were introduced as windbreak species, to protect crops and to reduce sand movement in the notorious winds of the Western Cape.

According to Owen and van der Zel (2000) formal forestry in South Africa before the Second World War was almost exclusively a state affair and strongly associated with agriculture, with the exception of the wattle industry in KwaZulu Natal which was privately owned and managed. It was only after the Second World War that a separate government department of forestry was established. The strategy of the early foresters was to focus on protection of the closed canopy natural forests while at the same time promoting plantation of exotic species.

Many small plantations, particularly in the rural areas of the Eastern Cape, were established on the natural forest margins to provide alternative pole and timber supplies for the surrounding inhabitants.

The boom period of settlement and expansion from the 1950s to 1970s in South Africa was characterised by an increase in plantation area, particularly in the private sector. The market for tanbark from wattle declined rapidly in the 1960s, and large areas of wattle in KwaZulu Natal were converted to *Eucalyptus* plantation, or sugar-cane production. By 1985 the Department of Forestry controlled 1.6 million ha of land in the former 'white' areas, of which 263,000 ha was under commercial plantations. The former black 'Homeland' governments controlled a further 350,000 ha, of which more than 150,000 ha were plantations. The area under private ownership was estimated at 800,000 ha (Owen and van der Zel, 2000). During this time, the Forestry Department delegated management of many of its indigenous forest areas to provincial departments of Nature Conservation, who managed them as nature reserves. These included coastal biodiversity reserves, mountain catchment areas and some plantations.

In 1990 the timber production activities in the former Republic of South Africa were commercialised under the South African Forestry Company Limited (SAFCOL). SAFCOL took over approximately 500,000 ha of State forestland, of which 263,000 was plantation. The State retained 86,000 ha of land, mostly closed canopy forest. At that time, the former 'Homeland' governments maintained more than 160,000 ha of commercial and community plantations and the private sector owned 952,870 ha, including 124,117 ha of wattle (Owen and van der Zel, 2000).

Since 1997 the government's Department of Water Affairs and Forestry (DWAF) has been involved in a major restructuring exercise in its commercial sector, in a move to rid itself of its timber production responsibilities. This exercise has largely been donor funded and driven, beginning with an options study (Hale and Associates, 1998) in which the future of the plantations was assessed. Following this, DWAF's commercial holdings were divided into three categories (Anon, n.d.):

- a. Commercially viable, producing the best quality timber, to be leased out on long-term contracts to established timber companies.
- b. Commercially viable, but less attractive to large-scale timber companies because of size or productivity. These areas will be leased to new partnerships between black entrepreneurs and private timber companies in an affirmative action programme.
- c. Non-viable plantations (mainly woodlots planted for fuel) to be devolved to local communities. In some areas the land is not considered suitable for plantations, and will be returned to the Department of Nature Conservation for rehabilitation of the natural vegetation (largely fynbos in the Cape).

This process is ongoing, with only some of the category A plantations having been leased out. DWAF has experienced problems with category C plantations because of conflicts with local communities, and labour issues. SAFCOL will be disbanded, once the mechanism for this has been established (Kock and de Beer, 2000).

1.2 Priority in planning

According to the Chief Director: Forestry within the government's Department of Water Affairs and Forestry, there is no collective national-level planning policy or process¹. The history of collaboration between line ministries in South Africa is poor, with little liaison between them. There is, however, a regional integrated development planning process, where service providers sit together to formulate regional Integrated Development Plans. Poverty

¹ Lael Bethlehem, Chief Director: Forestry, Pretoria, June 2000.

alleviation takes the highest priority on the agenda in the regions, followed by housing and education. Forests and woodlands are relatively low on the agenda and generally conservation for biodiversity *per se* is no longer considered a feasible option.

Indigenous forest and woodland management are two aspects of the new national planning process which is presently being undertaken within DWAF. This is a donor funded activity, and is scheduled to be completed by the end of 2001. Indigenous forests fall under the Indigenous Forest Management Division (formerly Conservation Forestry), but the responsibility for the management of woodlands still has to be clarified.

1.3 Relative importance in the national economy

Indigenous forest and woodland resources are generally undervalued in South Africa, and in the region as a whole, despite the fact that millions of people rely on them for their livelihood support (see for example Shackleton and Shackleton, 2000). This is because of governments' major focus on the management of timber resources in the past, with little attention paid to non-timber products. Non-timber products are particularly important in the deciduous forest areas. One third of South Africa is savanna (Low and Rebelo, 1996) and approximately 90% of the communal areas in the country are in the savanna biome (von Maltitz *et al.*, 1998). As yet, planners and policy-makers do not understand the contribution that these areas make to the local and national economy. Shackleton and Shackleton (2000) estimate that the harvest of woodland products in Mpumalanga and the Northern Province provides approximately US\$650 per household per year.

Even though South Africa has only 0.07% of the world's productive forest area, the plantations are a significant source of fibre and currently produce 1.2% of the global industrial output. In 1996/97 the plantations produced 18.6 million m³ of logs, at a value of R1.75 billion. In 1998/99 the figure was R2.268 billion². This compares with R2.249 billion from sugar cane and R5.397 billion from maize production. The contribution of the forestry industry (logs only) to the gross value of agricultural output in 1998/99 was 8.8%, of a total of R25.6 billion. This figure excludes further value adding processing for products such as paper, furniture, wattle extract and adhesives, eucalyptus oils, resins and other forest product exports (Owen and van der Zel, 2000). In 1997 the primary processing industry earned R9.15 billion in sales of sawn timber, pulpwood, mining timber, panel products, poles, charcoal, chips/mill residues and firewood. In 1998/99 the contribution of this forest products industry to the gross value of the manufacturing output for 1998/99 was 9.2%, of a total of R130.0 billion (FOA, 2001).

The value of indigenous logs sold in the southern Cape in 1998 totalled just under R1.5 million (see Table 1, Section 1.8; Lawes *et al.*, 2000). This return falls far short of the maintenance costs of the Forest Reserves, and results in all forestry activities in these areas having to be subsidised by the State.

1.4 Description of National Forestry Plan

Until 1994, the South African government viewed forests and woodlands in the country as being the 'guardians of its land, soil, vegetation, water, climate, wildlife, landscape, aesthetics and outdoor recreation' (Keet, 1976 in van der Zel, 2000). Forest policy was made by the government's Forestry Department to protect and maintain the forests for the benefit of the 'people'. However, this approach did not take into account the many rural dwellers who utilised the forests and woodlands as part of their livelihood strategies.

² At the time of writing, R1= USD 0.12.

In 1994, the new democratic government began the process of substantial forest policy revision (van der Zel, 2000). This included a commitment to wider participation in policy formulation by those who would be directly affected by the implementation of such policies (Foy *et al.*, 1998). The process began with stakeholder consultation, through public presentations, workshops and discussions with a broad spectrum of user groups, including those that had previously been marginalised. The result was a Green Paper (a draft policy document) which was published for comment in 1995. The discussion paper proposed that the new forest policy should incorporate not only the closed canopy forests and plantations, but also the 28 million hectares of woodlands which had previously been ignored. To do so, social forestry to encourage development through forest use and management would have to be promoted at community level, and the needs of women in forestry addressed.

The following nine principles were taken into account (DWAF, 1996):

- The value of the forest resources as a national asset
- The emphasis on democracy
- Gender equity
- Participatory development
- Consultation in policy formulation and implementation
- Sustainable forest management
- Scarcity of the country's water resources
- The need for a competitive and value-adding forest sector
- Recognised standards in employment conditions

Specific policies were developed on:

- Forestry's integration in catchment and natural resource management for development
- Working conditions
- Industrial forestry
- Community forestry
- Conservation of natural forests and woodlands
- Global concerns
- Research, education and training
- Relationships within the southern African region
- Bilateral international relations

This first consultation process culminated in the publication of the government's White Paper on Sustainable Forest Development in March 1996. In this document, there was a commitment to turn policy into action through the development of a strategic plan, the National Forestry Action Programme (NFAP).

The development of the NFAP was largely donor driven, in line with the global emphasis on development of appropriate forestry action plans at that time (Clement, 1996 in van der Zel, 2000), but used local expertise. Beginning in late 1996, information was gathered through a series of consultative workshops and meetings, nation-wide communication with interest groups, the formation of seven working groups, and the compilation of more than 25 background working papers, all co-ordinated by a Planning Task Team. This team drew invited representation from a range of interested and affected parties, including government officials, forest industries, trade unions, environmental interest groups, policy experts and NGOs involved in the delivery of community forestry. The consultative process brought together a wide range of knowledge, experience and opinion to strengthen the country's proposed new strategies (NFAP, 1997). The result is an action programme with objectives that are challenging but not beyond reach. The NFAP takes an inclusive approach, incorporating natural forests and woodlands together with industrial forestry and the contingent labour management and human resource development, because the forest sector is seen as one entity, with no boundary between its different components. The success of the

programme relies on the effectiveness of the business plans developed by the transformed institutions in the forest sector.

The initial time frame set out for the NFAP was three years, during which time it would be monitored, adapted and finally evaluated. Following this evaluation, a second consultative and participatory process would commence to develop the next phase. The three-year time frame was ambitious, however, and in mid-2001, nearly four years after the publication of the NFAP, this revision at national level has not yet begun. There are a number of reasons for this, most of which can be traced to the country's apartheid history. They include the lack (until recently) of clear roles and responsibilities within DWAF; a lack of information relating to the country's state-owned forest and woodland resources as a whole, as a result of the amalgamation of the forest services of the former RSA with those of the former 'homelands'; and the lack of capacity within Government to implement the process.

The National Forests Act (Act No. 84 of 1998) provides for special measures to protect and manage forests and trees. It prohibits the felling or damaging of any indigenous trees in any natural forests without a licence (Vermuelen, 2000). The Act also gives the Minister powers to intervene urgently to prevent deforestation and to rehabilitate deforested areas by the declaration of controlled forest areas.

1.5 Participation and degree of interaction of different sectors and stakeholders in the harvesting process: public, private, NGOs, local communities, universities, etc.

Participation by stakeholders in the harvesting process depends on the sector and the vegetation type. For most practical purposes, the sectors remain separate, and there is little interaction between them.

There are relatively few NGOs working exclusively in forestry in South Africa at present, and the ones that are active have focussed either on plantation forestry, urban greening or conservation of fragile environments. At national level, all stakeholders right across the forestry sector, from industry to communities, have a voice through the National Forestry Advisory Council (NFAC), a stakeholders grouping which meets regularly to advise the Minister on matters of policy and implementation. The NFAC has working groups and sub-committees which work together on specific tasks.

The Forest Owners Association (FOA), represented on the NFAC, is a powerful association of private, large-scale, timber-growing landowners which provides an extension service to its members. It also maintains a database of forestry facts and provides an information service to the public. In future the FOA will merge with the smaller Southern African Timber Growers Association, an association of largely small growers, to form Forestry SA. In 1995 the Environmental Committee of the FOA helped develop a set of harvesting guidelines for its members, designed to improve conservation of the unplanted areas of plantations (Skotcher, 2000). These guidelines (Guidelines for Environmental Conservation Management in Commercial Forests in South Africa), based on similar principles developed in New Zealand, were developed in collaboration with FESA (Forest Engineering Southern Africa) (FIEC, 1995).

A significant amount of government to government aid has been channelled through forestry projects linked to the government Forestry Department in an attempt to raise the capacity of forestry staff to manage their assets. This includes a major project to support planning and management in the indigenous forests. External consultants work together with local staff on all aspects of forest management. To date, many of the specialised research tasks in both plantations and indigenous forests have been contracted out by DWAF to local and international consultants – either through the government's research body, CSIR, or to private

consultants and university researchers. In this way, much of the specialised expertise in forest biodiversity and management has come to rest with consultants and academics, leaving the government departments with a largely managerial role. One of the problems with this approach is that the expertise and information relating to forest use and management is often case specific, and remains scattered amongst these disparate groups.

1.6 Institutional structure of harvesting planning and policy

The institutional profile in the harvesting planning and policy-making process is dependent on the tenure ship of the land and its degree of management.

1.6.1 Forest reserve on state land

Harvesting of timber on State Forest Land is strictly controlled. The timber species (comprising about nine different species, but mainly *Podocarpus* spp. and *Ocotea bullata*) are harvested after reaching a point of senility. They are either sold as logs by public auction or as standing timber to contractors. Quota setting is done using a system designed by DWAF's Indigenous Forest research unit in the Southern Cape together with the national research institute, CSIR, based on many years of scientific research (Vermuelen, 2000).

Apart from the Rumohra fern in the Eastern Cape, and some harvesting of *Boletus* fungi in the plantations (see von Maltitz and Grundy, 2000), harvesting of non-timber species is at present largely unmanaged and technically illegal. In some areas people may buy permits to harvest fuelwood, thatching grass or medicinal plants. In such cases, regulation of permits is done either by the Forest Department, or by the relevant managers, for example where the Reserve has been devolved to a provincial department such as Nature Conservation.

1.6.2 Private land

All indigenous tree species are protected from harvesting by the new Forest Act of 1998, which requires owners to obtain a licence to harvest them. Private companies growing exotic timber and pulp species formulate and execute their own harvesting plans, guided by principles set out by the Forest Owners Association in their 1995 'Guidelines for Environmental Conservation Management in Commercial Forests of South Africa' (Skotcher, 2000). Fragile environments and particularly water catchments are protected. Small growers are also guided by management principles set out by SAWGU (South African Wattle Growers Union) and SATGA (South African Timber Growers Association). Both these independent associations, together with the Forest Owners Association, have conservation advisory committees made up of members.

1.6.3 Communal land

Communal land is nominally owned by the State, but used and managed by the people living on it. In all communal areas in the past 'traditional' regulations governing the use and management of the commons, including woodlands and forests, applied. Most of these regulations were not traditional at all but rather the result of collaboration and conflict between colonial powers, traditional leaders and extension officers over the years (Neumann, 1996). Although these traditional rules were based on principles of sustainable use of a scarce resource, they were not founded on actual facts, espousing rather the notion of 'wise use and management'. Traditional regulatory mechanisms have largely broken down over the past two decades or more, due in part to the forced removals and undermining of traditional leadership systems by the apartheid regime, and also to the change to more western thinking and the commercialisation of many of the forest products.

The 1998 Forest Act protects all indigenous woodland and forest (and a forest is defined as more than two trees whose canopies touch) from destruction, so that in theory a licence is required before any harvesting can be carried out. None of the government departments have enough staff to be able to enforce this regulation on communal land, however.

1.6.4 Recently devolved forest land which has reverted to community ownership as part of the land restitution process

At present the principles of 'wise use' are supposedly in place in these areas, but in some cases an open access situation may exist if the proper management structures are either not in place or not yet functional on the ground (see Grundy *et al.*, in prep). In many cases the land will revert to communal ownership, but the communities will be required to maintain the integrity of the forests as biodiversity reserves. Management policies in such areas will be made by community representatives, with external experts acting as advisors.

1.7 Compliance with existing international guidelines on best practice for sustainable logging

Since the lifting of cultural and economic sanctions on South Africa in 1994, the country has been involved in a number of regional and international forestry initiatives. Regionally South Africa is a member of SADC (Southern African Development Community) and has contributed to a SADC Forestry Sector Policy and Development Strategy developed by the FSTCU (Forest Sector Training Co-ordination Unit) in Malawi in 1997. The policy contains guidelines on shared challenges and strategies, including poverty alleviation, combating deforestation and land degradation, sustainable forest management, conservation of biological diversity, gender equality, information exchange, wood for energy and public awareness and participation (van der Zel, 2000). These principles are mirrored in the new South Africa Forestry Policy.

Internationally the government of South Africa was a member of the Intergovernmental Panel on Forests, and the subsequent Intergovernmental Forum on Forests. As part of the intergovernmental initiatives, South Africa has been involved with the development of standards for sustainable forest management, together with the following organisations and groupings: The African Timber Organisation; Dry Zone Africa; International Tropical Timber Organisation; Montreal Process; North Africa and Near East Process; Pan-European (Helsinki) Process; Tarapato Proposal, among others (Skotcher, 2000).

A number of non-governmental organisations have been active in South Africa in the development and testing of principles, criteria and indicators, for well managed forests. These include the Forest Stewardship Council (FSC) the ISO Technical Committee, CIFOR, the Nordic Forest Certification Project, and the World Wide Fund for Nature (Skotcher, 2000). These on-going processes leave out the vast woodland areas, most of which go unmonitored for the present.

The UNCED Earth Summit in Rio de Janeiro in 1992 resulted in numerous initiatives that focus on sustainable development. The second Earth Summit will be held in South Africa in late 2002. Closer involvement in global debates over biodiversity issues should have a positive effect on forest management within in the country. The ability of the government's Forestry and Departments to implement these global conservation principles on the ground will depend on staffing capabilities, however. The face of forestry in South Africa has changed dramatically in the past six years. In the national Head Office, all of the divisional Directors and assistant directors have been in office for less than five years, several of them having been drawn from non-forestry backgrounds. In the provinces, the managers are short of experienced staff who have been trained in the new directions.

1.8 Main production areas of the country

Indigenous forests

Figures from 1994 in Owen and van der Zel (2000) show that South Africa at that time had about 20% of its total land surface of 122 103 000 ha classified as indigenous forest. These figures contradict others given in this paper, but presumably include some of the country's dry woodlands and thicket. Of this total, 1 963 000 was shown as protected as Forest Reserve, but only 65 500 ha was classed as actively managed for production. Whatever the real figures are, they will have changed in the past 6 years, and are set to change again as a result of the country's major land reform programme. The recent land restitution process has meant that many of the Forest Reserves are contested by local communities, and future ownership and management of these areas is yet to be resolved.

Even though indigenous forests make up less than 2% of the land surface in South Africa, because of the size of the country, these biomes encompass extensive areas and contain valuable resources. They are valued for a number of different reasons:

- Biodiversity
- Ecotourism
- Timber production
- Non-timber forest products, particularly firewood, poles and medicines.

The closed-canopy forests play an insignificant role in terms of wood production, but are a critical component of the environment and provide significant recreational areas (Owen and van der Zel, 2000). 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.

There are nine indigenous species which are regularly harvested from indigenous forests (Table 1), the most well known being the two types of Yellowwood (*Podocarpus latifolius* and *P. falcatus*), and Stinkwood (*Ocotea bullata*). These areas also sustain local wood-based industries which are economically important (NFAP, 1997).

The forests also provide non-timber products for the surrounding communities, and for the market, on an informal basis. These products include gathered foods, medicinal plants, handcrafts and household items, fuel and construction wood which to date have not been quantified. In addition, local communities derive other non-consumptive goods and services such as spiritual and cultural benefits (Lawes *et al*, 2000).

Table 1. Commonly harvested timber species and volumes sold by auction for the period 1996-1998 from the southern Cape forests (Lawes *et al.*, 2000). This does not include timber from the Amatola forests.

Species	Common Name	Volumes of roundwood timber sold (m ³)		
		1966	1997	1998
<i>Ocotea bullata</i>	Stinkwood	178	224	260
<i>Podocarpus latifolius</i>	Yellowwood	581	400	848
<i>P. falcatus</i>	False yellowwood	30	16	33
<i>Oleacapensis</i> ssp. <i>macrocarpa</i>	Ironwood	147	173	313
<i>Olinia ventosa</i>	Hard pear	53	61	124
<i>Platylophus trifolius</i>	White alder	127	188	133
<i>Apodytes dimidiata</i>	White pear	77	80	94
<i>Pterocelastrus tricuspidatus</i>	Cherrywood	32	50	36
<i>Curtisia dentata</i>	Assegai	22	23	29
Other species		130	99	119
Total volume income (R)		1377	1314	1989
Average price per m ³ (R)		1 186 466	1 107 525	1 445 513
		862	843	727

Plantations

In 1998 (the latest available figures), the ownership of the plantations was divided as follows (Owen and van der Zel, 2000):

Ownership	Area (ha)	% of Total Area
Public (State managed, but soon to be restructured)	455,541	30
Private (Companies)	743,270	49
Private (Farmers)	319,327	21
Total Plantation Area	1,518,138	100

Provincial distribution of major plantation areas is as follows (NFAP, 1997):

Province	% of Total Area
Northern Province	5
Western Cape	6
Eastern Cape	11
KwaZulu Natal	37
Mpumalanga	41

The major species planted for timber and pulp are:

Species	% of Total	Hectares
Softwoods (mainly <i>Pinus</i> spp.)	52.6	797,610
<i>Eucalyptus grandis</i>	29.0	441,394
Other <i>Eucalyptus</i> species	10.3	156,570
<i>Acacia mearnsii</i> (Black wattle)	7.4	112,029
Other	0.7	10,535

Some small-scale communal farmers, particularly in KwaZulu Natal and the Eastern Cape, belong to outgrower schemes set up by large commercial companies. In these schemes, they grow exotic species under contract for timber and pulp. Management guidelines, including harvesting, are set out by the contracting company.

Woodlands and Thickets

The most extensive woody resources in South Africa are found in the drier areas covered by savanna woodlands and bushveld. These areas are constantly dwindling as a result of clearing for agriculture, while the remainder is heavily utilised for a variety of products, including fuelwood, construction materials, wild foods and medicines. Since this use remains essentially a 'Hidden Harvest' (sensu Scoones *et al.*, 1992), it is difficult to find countrywide figures for amounts harvested and the value that these products represent to both rural and urban households. Commercialisation of forest and woodland products is on the increase in South Africa, but the impact of such activities on the biodiversity of the forests and woodlands is yet to be ascertained. Hardwood species such as *Pterocarpus angolensis*, which used to form the basis of a thriving small-scale carpentry and carving industry in the savanna regions, have largely been depleted due to over harvesting. A positive example of

commercialisation is the internationally marketed liqueur which is made from the fruit of *Sclerocarya birrea*, the marula tree.

OVERVIEW OF PRESENT STATE OF BIODIVERSITY IN THE COUNTRY

2.1 Knowledge of biodiversity

South Africa is ranked as the third most biologically diverse in the world, containing between 250,000 and 1,000,000 species, many of which occur nowhere else. For plants alone, some 18,000 vascular plant species occur in the country, of which 80% are endemic (Cowling and Hilton-Taylor, 1997). Animal life is equally varied, both in terms of numbers and variety (see Box 1). South Africa hosts an estimated 5.8% of the world's total of mammal species; 8% of bird species; 4.6% of the global diversity of reptile species; 16% of marine fish species; and 5.5% of the world's described insect species. In terms of the number of endemic mammal, bird, reptile and amphibian species, South Africa is the 24th richest country in the world, and the 5th richest in Africa (World Conservation Monitoring Centre, 1992).

South Africa is also the only country on Earth to have within its borders an entire plant kingdom – the Cape Floral Kingdom – which is one of just six in the world. This area has the highest recorded species diversity for any similar sized temperate or tropical region in the world and is the world's "hottest hotspot", or the area where high levels of species richness, endemism, as well as threat coincide. Other biomes - or habitat types - are also of global conservation significance: one third of the world's succulent plant species are found in South Africa, and the succulent karoo is recognised as a major centre of endemism. Seven major terrestrial biomes, or habitat types, exist in South Africa: forest, fynbos, grassland, Nama karoo, succulent karoo, savanna and thicket. These biomes can in turn be divided into 70 vegetation types, which are communities that share common species, have similar vegetation structures, and share the same set of ecological processes (Low and Rebelo, 1996).

A well developed system of terrestrial protected areas exists in the country, and it is in such areas that efforts to conserve biodiversity have been focused. The 403 formally protected areas (national parks, provincial reserves or equivalents) constitute some 6% of the land surface area, placed under the control of 13 different management agencies, and falling under some 11 pieces of national legislation (DEAT, 2001). The extent to which viable populations are conserved in such areas is not known but 74% of plant, 92% of amphibian and reptile, 97% of bird, and 93% of mammal species of South Africa are estimated to be represented in the present protected area system (Siegfried, 1989).

Box 1. Species richness of South Africa taxa³

Taxa	Number of described species in South Africa	% of the Earth's total
Mammals	227	5.8
Birds	718	8
Amphibians	84	2.1
Reptiles	286	4.6
Freshwater fish	112	1.3
Marine fish	2 150	16
Invertebrates	77 500	5.5
Vascular plants	18 625	7.5

³ Figures adapted from Siegfried 1989; World Conservation Monitoring Centre 1992; and pers. comm. with Dr H. Robertson, South African Museum.

Within the seven different biomes, about 70 distinct vegetation types or ecozones are recognised. Each ecozone is characterised by a coherent array of communities with shared common species, similar vegetation structure and the same ecological processes (DEAT, 2001). There are three major regional centres of plant diversity and endemism: The Cape Floristic Region (essentially the Fynbos biome), the Succulent Karoo and the Maputaland – Pondoland region on the east coast. Within these regions a further 14 specific local centres are recognised, many of them indigenous forests.

The forest and woodland biomes of the country (Forest, Thicket and Savanna) have been studied over the years and are fairly well understood in terms of characteristic species. Firstly Acocks (1975) in a description of the Veld Types of South Africa, identified three major forest areas. Then White in 1983, in his *Vegetation of Africa*, classified the vegetation according to phytocoria. Finally Low and Rebelo (1996) divided the vegetation into the seven biomes listed above (Figure 1), in which three broad forest types were classified within the evergreen forest biome: Coastal forest, Afromontane forest and Sand forest. Within the deciduous forests and woodlands categories (Thicket and Savanna), there are 12 different ecozones, classified according to species and structure, many of them woody scrub. Midgley *et al* (1997) note that tree endemism is low in the region, the exception being the Pondoland Centre in the Eastern Cape, where several rare endemics are associated with an outcrop of Cape Super group sandstone. In terms of diversity, available data suggest that the Indian Ocean forests of KwaZulu-Natal have higher richness than the higher Afromontane forests, and coastal and montane forests are poorer in species than those of similar structure in KwaZulu-Natal (Midgley *et al.*, 1997).

Inventories are well established for some ecosystems and species in South Africa (DEAT, 1997) but are biased towards plants, mammals and birds. Despite the number of qualitative works, however, there have been no objective, quantitative classifications of the forest and woodland areas in South Africa to date (Geldenhuys, 2000). Inventory work requires skilled personnel and there is both a dire shortage of suitably trained people to do this work, and a lack of funding for training (DEAT, 1997). A worrying trend is the decline in research capacity, most notably for taxonomy. Over the last ten years the number of taxonomists employed in South Africa's museums has declined by 35%, matched by a concurrent fall in research grants to museums (Herbert, 2001).

Presently, a multitude of organisations and individuals is involved in the research and development of the country's genetic resources. There is, however, an urgent need for a national initiative to focus on co-ordinating biodiversity information and research. Research organisations look to biodiversity prospecting agreements as an important avenue for revenue generation and technology transfer, although there is a lack of legislation to guide these agreements (DEAT, 1997). Biodiversity prospecting is recognised as an important way in which inventory work can be strengthened in South Africa.

In general the country has a good network of well-managed ex-situ plant collections, through the National Botanic Institute, the Agricultural Research Council, as well as the museums and herbaria. DWAF has several arboreta of indigenous forest species in the southern and eastern Cape, which have been poorly managed to date. DWAF staffs are in the process of updating their records and developing management plans for these collections.

2.2 Status of mapping of biodiversity within the forest ecosystems of the country

Present forest management in South Africa once again reflects the country's apartheid history. The evergreen forests of Knysna in the southern Cape are the only well researched and intensively managed forest areas of the country, where the focus has been on timber harvesting, research and recreation. Now that all the forested areas have been returned to DWAF's ultimate control (even though in some cases day to day management may have been delegated to provincial conservation departments), attempts to bring all forests to the same

standard of management are being undertaken (N. Michell, pers.comm⁴). This includes a comprehensive database of all the forested areas in the country, and a description of the major forest types in the different landscape zones, based on climate, terrain physiology and disturbance frequency. While this information is available for the Knysna forests, generally sites are ecologically complex and the forest types uses are only approximate, in order to simplify management (see Geldenhuys, 2000). In a concomitant activity, DEAT has tasked its Biodiversity Working Group 1 to make a scientific appraisal of existing protected areas in the country. This is being undertaken in 2001.

Mapping of the situation and extent of all the State-owned indigenous forest areas has been an on-going, donor-funded project within DWAF for the past two years. As a first step to developing criteria and indicators for sustainable forest management, the government needed to be able to define its forest assets. Because of the division of forest areas along political lines in the past and the relatively poor management regimes in the former 'homelands', however, accurate records of ownership had not been kept. The national forest map is due for release towards the end of 2001, but will only encompass closed canopy forests and plantations. No plans have been made to map the woodland areas in detail.

Within the private sector there are also planning initiatives underway to encourage the sustainable use of forest resources. These initiatives have been separate from government planning. The Forest Owners Association originally began its own process of developing criteria and indicators for sustainable forest management as part of the certification process, which has since been superseded by the government process. In addition to these two activities, the large private forestry companies have begun a collaborative programme with the aim of mapping all their plantations and categorising them into standardised units. The companies plan to house this database at the Centre for Commercial Forestry Research in Pietermaritzburg in Natal. SATGA, the South African Timber Growers' Association, has its own programme of environmental audits for small growers, with the aim of developing environmental management guidelines for its members (SATGA, 2000).

2.3 Rates of change

Biodiversity is under considerable threat in South Africa and a substantial proportion of natural habitat has already been transformed into other land uses. Threatened species (as listed in the Red Data Books) include 3,435 (15%) of South Africa's plant species; 102 (14%) of bird species, 72 (24%) of reptile species, 17 (18%) of amphibian species, 90 (37%) of mammal species, and 142 (22%) of butterfly species. Comparisons between the number of threatened plants in 1980 (a total of 1,915 threatened taxa), 1984 (2,373) and 1995 (3,435) indicate an 80% and 45% increase respectively (Hilton-Taylor, 1996). In fact, South Africa now has the dubious reputation of having the highest known concentration of threatened plants, and the highest extinction estimates for any area in the world.

The degree to which the different terrestrial biomes are threatened varies, depending upon the fertility of the soil, human population pressures, the economic value derived from the area, and the extent to which the biome is conserved in protected areas. Noteworthy is that the existing reserve system in southern Africa is estimated to protect 74% of all vascular plants (Siegfried, 1989). Three of the seven described biomes (desert, fynbos and savanna) have more than 10% of their area conserved, with the forest biome approaching 9%, and 14 of the 70 vegetation types have more than 10% of their area conserved (Rebello, 1997). However, the Nama-karoo, grassland and succulent karoo biomes have less than 3% of their area conserved. It is noteworthy that of the nine forest vegetation types, only three fall below the recommended 10% conservation target; one of these however, the 'Ngongoni Veld', has been identified as a top priority for conservation in SA (Rebello, 1997). Table 2 indicates the

⁴ Nicky Michell, Head, Scientific Services, DWAF Eastern Cape, June 2000

conservation status of coastal and inland forest types in South Africa, and their extent of transformation.

Table 2. Conservation status of coastal and inland forests in South Africa

Vegetation type	Area conserved (%) 1996	Area transformed (%) ⁵
Coastal Tropical Forest	9.01	
Coastal Forest & Thornveld	12.19	43
Alexandria Forest	10.04	No data
Pondoland Sourveld	11.43	94
Knysna Forest	16.28	24
‘Ngongoni Veld	0.23	87
Zululand Thornveld	11.06	54
Eastern Province Thornveld	5.92	No data
Inland Tropical Forest	10.26	71
NE Mountain Sourveld	11.29	65
Lowland Sour Bushveld	9.45	76

Adapted from Rebelo (1997).

To date estimates of forest and woodland loss are limited. Once the forest mapping process is complete it will be possible to monitor changes over the years. In the woodland and thicket areas, however, there will be no baseline to measure from. Currently 6% of South Africa’s land surface is covered by conservation area, and the government has plans to increase it to 8% (DEAT, 2001). Since 1994, in National Parks alone, 227 307 ha of new land have been proclaimed as protected areas. At the same time, some areas which were formerly protected but which have been claimed by local communities in a process of land reformed are being desisted. This is an on-going process and one that will take several years to complete.

2.4 Establishment of cause and effect in measured and estimated loss of forest biodiversity

Comprehensive estimates are not available as to the extent of modification of forests and woodlands, although a conservative assessment is that at least 25% of land has been transformed for purposes of cultivation or afforestation, for urban or industrial development, or to enable roads, railways and dams to be built (Macdonald, 1989). Overgrazing, alien plant and animal infestations, the overexploitation of certain species, and the pollution or toxification of the soil, water and atmosphere have also had major effects on South Africa’s biodiversity.

2.4.1 Alien invasive species

Over 50 taxa of both animals and plants are recognised as alien invasive species which are placing increasing stress on natural communities and the species they contain (DEAT, 2001). Commercial forestry has been one of the country’s major sources of alien infestation and 38% of the area invaded in South Africa is occupied by species used in commercial forestry (Working for Water, 1999). Almost 1,900 of the 3,435 Red Data species are threatened wholly or in part by alien invading plants (Hilton-Taylor, 1996).

The negative impact of exotic plantations on natural species diversity is a contested issue (Everard, 2000). While some maintain afforestation creates biological ‘deserts’ and provides seed banks for alien invasive species, others point to the many plant and bird species that inhabit such plantations. In South Africa, in addition to the 1,518,336 ha of exotic tree species

⁵ Based on data for 1979-1984 from Macdonald (1989)

planted on private lands, there are approximately 350,000 to 400,000 ha that remain in their natural, unaltered state. This is because on average only between 60 to 75%⁶ of the forestry estates are planted with trees. Of the unplanted areas, commercial timber companies have set aside an estimated 42,529 ha of land in 107 designated areas under two government initiatives: the Department of Environment and Tourism's Natural Heritage Programme and the government's provincial conservation bodies' Sites of Conservation Significance. Most of these sites have been set aside to protect specific plant communities and habitats, or to protect one of more Red Data species (Edwards and Skotcher, 2000). Currently, such conservation sites offer protection to 110 Red Data species, of which 45% fall into the rare category. Twenty percent are classified as vulnerable, 16% have specific regional conservation significance and 19% fit into a number of other categories. Grassland sites provide habitat to 48 Red Data species, while 30 are conserved in indigenous forests, 13 in thicket habitats, and 14 in wetlands. The balance is found in more than one habitat (Edwards and Skotcher, 2000). With ongoing research, the number of species conserved is likely to increase.

There is also real concern over the impact of afforestation and timber harvesting on water flows, wetlands and catchment areas. Invading alien plants are estimated to use about 3,300 million m³ of water that would otherwise flow to rivers (Working for Water, 1999). The government has classified plantation forestry as a stream-flow reduction activity (Dye and Bosch, 2000), and in the past three years has introduced swingeing control mechanisms to limit water use by exotic vegetation, which have effectively stopped the expansion of the small-scale wattle-growing industry (Ngcobo, 2000). The focus of research in this area has been on the physical results of reduced water availability. The impact of stream-flow reduction on species diversity has yet to be well researched.

In the past five years the country has embarked on a major alien invasive eradication programme, but this is proving harder to execute than first thought. The introduction of a species of gall-rust to eradicate *Acacia saligna* in the Western Cape is proving to be slow, with several previously unforeseen adverse social consequences. The attempt by DWAF to outlaw all alien tree species that are classified as invasive is meeting with strong resistance from the tree-growing lobby. Municipalities have planted these species over the decades as amenity trees in towns and cities, while many small timber growers have built their livelihoods based on some of them.

2.4.2 Clearing for agriculture, afforestation and urbanisation

Although accurate figures are not available, large areas of indigenous forest and woodland are cleared every year. Macdonald (1989), using statistics from 1982 to 1987 for the former RSA, concludes that 248,674 km² has been transformed and that cultivated agricultural fields constitute more than half this area. Slash and burn activities within protected natural forests are particularly evident in the former Transkei region of the Eastern Cape (de Villiers, pers.comm.⁷) where the country's new democracy has been mistaken for anarchy (Grundy *et al.*, in prep).

Current estimates are that 12.2% (14.9 million ha) of the country is under cultivation (Fairbanks *et al.*, 2000), which represents a slight decline over the past 10 years, largely due to increases in settlements, grass conversion schemes, higher input costs, and market-related forces (DEAT, 1999). Grazing areas have also declined in all provinces, except the Free State, in many cases because of rapid urbanisation (DEAT, 1999). Commercial forest

⁶ (Estimates vary here – Everard (2000) maintains 60-65% is planted with trees, while Edwards and Skotcher (2000), in the same publication, maintain the figure is 70-75%).

⁷ D. de Villiers, Deputy Director, Eastern Cape Nature Conservation, Dept. Economics, Environment and Tourism, October 2000.

plantations have increased dramatically over the past ten years, with a 50.5% increase being recorded over the period 1985 to 1994 (Fairbanks *et al.*, 2000). However, in more recent years such expansions have slowed down. Urban settlements have grown substantially, although the spatial extent of transformation is relatively small.

2.4.3 *Harvesting non-timber products for subsistence and for sale*

In its protected area management programme, the government has attempted to ensure that representative samples of the country's biological diversity are conserved, although it recognises that the Grassland and Thicket biomes are inadequately represented (DEAT, 2001). Conservation status is not enough to automatically protect forest and woodland species, however. Woody species in both indigenous forest and woodland are heavily utilised in most areas of South Africa for poles, fuelwood and medicinal plants. Some slow-growing hardwood species, such as (*Ptaeroxylon obliquum*) Sneezewood, and *Ocotea bullata* (Stinkwood) are virtually extinct outside the intensively managed forest areas. This is because their bark is highly prized for medicinal purposes, and there is a thriving trade in medicinal bark in the country (DEAT, 2001). The survival of another indigenous tree, *Warburgia salutaris*, which grows at the forest edge, is also threatened for the same reason (Cunningham, 1988 in Lawes *et al.*, 2000). Ring-barking by inexperienced gatherers whose main aim is to collect as much bark in the shortest time is the major problem.

Biodiversity prospecting is an international problem that the Government has addressed in its 1997 White Paper. South Africa is a favoured destination for companies seeking potential new crops and novel biochemical molecules with medicinal, agricultural, horticultural, environmental or other economic potential (Laird and Wynberg, 1997). This is largely because of the country's high level of endemism and diversity, comprehensive knowledge base of the flora and fauna, considerable scientific capacity, well-developed infrastructure, and well-managed protected areas and living collections, which enables the reliable sourcing of materials. A range of provincial departments is involved in issuing permits for collecting activities, as are central government agencies. Considerable activity exists outside of this formal network, with daily removals of genetic material out of the country. Export and use of South Africa's biodiversity is virtually uncontrolled at present and the trend is one of limited benefits being derived by South Africa from its biodiversity (Wynberg, 2001). Most species to date, apart from *Prunus africana* and *Combretum caffrum* used for an anti-cancer drug are not woody species, however.

2.4.4 *Lack of institutional control over resource use on State land*

The current government institutional arrangements for protected area management do not make for effective conservation (DEAT, 2001). This is due in general to the legacy of apartheid which left most government departments with a combination of poor management, lack of resources (both human and financial) and lack of adequate staff training. A strong cadre of national scientists exists, but few researchers have management experiences, or the breadth of knowledge required for the job. Recruitment of young black South Africans is poor (DEAT, 1997). In addition the majority of the forests and woodlands on State land which fall under communal management have tended to become open access areas with time. This is largely due to the breakdown of the traditional management systems with no effective alternatives in place.

OVERVIEW OF PRESENT STATE OF BIODIVERSITY CONSERVATION AND PLANNING

3.1 Relative priority in national planning policy

Conservation has long been practised by the peoples of South Africa, starting from the first hunter-gatherers who applied elaborate management systems to regulate their use of natural resources. Such systems changed dramatically with the arrival of agriculture in the region 2000 years ago, and with the colonisation of South Africa in 1652. A suite of new regulations has been introduced over the past centuries to protect the country's natural resources, and in many cases, the interests of the colonial and apartheid governments. Thus conservation has featured prominently in national planning, but often to the detriment of most of the country's inhabitants (Rabie and Fuggle, 1992).

Up until the early 1990s, biodiversity policy and practice in South Africa focused predominantly on protected area management and on protecting threatened species. Scant attention was paid to the need to integrate conservation into an overall land-use strategy for the country, or to the integration of biodiversity considerations into sectoral plans and programmes. The need for a more holistic and landscape-based approach is now well recognised, but policy has proved difficult to put into practice. This has largely been due to a lack of political will and understanding of the relevance of biodiversity. In truth, biodiversity issues at the strategic planning level remain marginalised and narrow.

3.2 Perceived degree of participation of the country in the Convention on Biological Diversity (CBD), and perceived benefits there from

South Africa is a party to the Convention on Biological Diversity (CBD), having ratified the agreement in 1995. The country participates actively in meetings of the Conference of Parties, of SBSTTA, and on various fora such as the Panel of Experts on Access and Benefit-Sharing. The Department of Environmental Affairs and Tourism is the lead government department responsible for implementation of the CBD in South Africa.

Political changes in the country, combined with anticipated ratification of the CBD, led to the government initiating a policy process in 1995 to develop a national biodiversity policy and strategy that reflected the interests and aspirations of the South African population⁸.

In July 1997 a White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity was gazetted (DEAT, 1997) and, following minor modifications by Cabinet, was adopted by Parliament as formal policy. Shortly thereafter the management and support structures for the process concluded their work and the Department of Environmental Affairs and Tourism assumed responsibility for further implementation. The end result is a comprehensive policy that breaks markedly from past approaches to biodiversity conservation in South Africa. This it does through the identification of six goals, and within a broad vision for the conservation and use of biodiversity in South Africa. This vision is articulated as:

“A prosperous, environmentally conscious nation, whose people are in harmonious coexistence with the natural environment, and which derives lasting benefits from the conservation and sustainable use of its rich biological diversity.”

The six goals of the White Paper are:

1. To conserve the diversity of landscapes, ecosystems, habitats, communities, populations, species and genes in South Africa;
2. To use biological resources sustainably and to minimise adverse impacts on biodiversity;

⁸ See Wynberg & Swiderska 2001 for a comprehensive review of this process.

3. To ensure that benefits derived from the use and development of South Africa's genetic resources serve national interests
4. To expand the human capacity to conserve biodiversity, to manage its use, and to address factors threatening it
5. To create conditions and incentives that support the conservation and sustainable use of biodiversity;
6. To promote the conservation and sustainable use of biodiversity at the international level.

Each of these goals in turn comprises a number of objectives, which detail strategies through which to meet the objectives. The Biodiversity White Paper thus represents a combined attempt to develop both a policy and a strategy for implementation, but does not go so far as to describe a detailed action plan. In this regard South Africa's biodiversity strategy does not fit neatly within the conventional Global Environmental Facility (GEF) description for a National Biodiversity Strategy and Action Plan (NBSAP). It does however go some way towards fulfilling national obligations towards Article 6 of the CBD, which requires Parties to develop or adapt national strategies, plans or programmes for the conservation of biodiversity.

Implementation of the Biodiversity White Paper has been slow but there are now encouraging signs that steps are being taken to bring biodiversity to the fore. The Department of Environmental Affairs and Tourism has been restructured, allowing for a realignment of the functions of biodiversity management and the deployment of additional personnel. New legislation for environmental management (the National Environmental Management Act) has also been enacted, providing a powerful new framework for environmental and biodiversity management in South Africa.

A new Biodiversity Act is also presently being drafted, including measures for:

- Biodiversity planning;
- Species and ecosystem conservation;
- Protected areas;
- Community-based natural resource management;
- Controlling and eradicating alien species;
- Biosafety;
- CITES;
- Bioprospecting; and
- Institutional arrangements required to give effect to the new legislation.

Strategies and actions in the new Biodiversity Act are envisaged to be synergistic with those to be developed in the NBSAP. The stated rationale of the NBSAP is to:

Set medium- to long-term strategies with respect to biodiversity management;

- Translate policy objectives into actions with timeframes and address gaps in the White Paper;
- Enable DEAT and other government departments to develop a coherent portfolio of biodiversity programmes and projects;
- Provide a tool for DEAT to coordinate, monitor and evaluate biodiversity-related actions in the country;
- Provide a tool for DEAT to mobilise and deploy resources for biodiversity management;
- Inform capacity development needs with respect to biodiversity management; and
- Clarify roles of stakeholders in biodiversity management (DEAT, 2001).

3.3 Institutional structure of government biodiversity planning and policy-making

Prior to democracy in South Africa, civil society had enjoyed little influence in the manner in which decisions were made about biodiversity, and had no status on any of the formal structures set up to consider its conservation and use. A chasm also existed between those

from the “old guard” – who were typically “expert-driven” natural scientists who were disinterested in or antagonistic towards the broader social and political context of biodiversity; and those from civil society organisations who were “process driven” and committed to principles of social and environmental justice, but often lacking formal scientific training and knowledge about biodiversity (Wynberg and Swiderska, 2001).

Such differences demanded the need for a fairly exhaustive participatory process and a strategy was designed to incorporate both the political process necessary to facilitate ownership and acceptance of the policy, as well as the technical component required to articulate substantive issues.

3.3.1 Biodiversity Planning

Important new measures have been introduced for environmental planning through the National Environmental Management Act which provides the foundation for an important shift in the function of the Department of Environmental Affairs and Tourism (DEAT) - from one that manages the environment, to one that facilitates, monitors, co-ordinates and streamlines the environmental functions in other departments. Key departments with functions that may significantly affect the environment, including those responsible for Land Affairs, Agriculture, Housing, Water Affairs and Forestry, Trade and Industry, Defence, amongst others, are required to prepare environmental implementation plans (EIPs) and environmental management plans (EMPs) to co-ordinate and harmonise environmental policies, plans, programmes and decisions so as to promote consistency in exercising functions that may affect the environment.

- The EIPs must describe policies, plans and programmes that may significantly affect the environment, explain how these policies, plans and programmes will comply with the environmental management principles, and how the departments will ensure that their functions are exercised soundly.
- The EMPs must describe the departmental functions, give environmental norms and standards, describe policies, plans and programmes and their relative priorities, state the extent of compliance by other organs of state and persons with such norms and standards, and specify arrangements for co-operation.

The focus thus far for EIPs and EMPs has been on cooperative governance, and attaining clarity on the environmental responsibilities of national, provincial and local government, rather than on the setting of standards. Although too early to assess, it would seem that EIPs and EMPs are useful tools to outline the functions of government and their respective scopes of responsibility. It is intended that the EIPs and EMPs be used as mechanisms to ‘mainstream’ biodiversity considerations into sectoral plans, policies and programmes, through dovetailing with biodiversity planning initiatives.

Although not yet finalised, several sections of the new Biodiversity Act will have implications for biodiversity planning. In addition to the EIPs and EMPs it is intended that stronger emphasis be placed on detailed conservation planning, with an emphasis on bioregional planning. Furthermore, it is intended that

- Species or ecosystem-specific plans be initiated through legislating for the development of recovery plans for ‘emergency’ species or ecological communities;
- Conservation plans for other species of conservation importance, such as migratory species; abatement plans for significant threats; and
- Management plans for ecosystems considered to be a national conservation priority.

3.4 Overview of the role of NGOs and local communities in biodiversity conservation

Outside government and the research institutions, biodiversity conservation activities tend to be few and fragmented across the country. The Wildlife Society of South Africa, a national NGO, has a particular interest in the conservation of indigenous forests. In 1985 the organisation undertook a survey of indigenous forests in the former Transvaal, Free State and Transkei, detailing the location, size and species diversity of all forests over 50 ha in these provinces. The Society also co-ordinates Timber watch, which is a consortium of NGOs and private individuals who are concerned about the threat to biodiversity by the spread of commercial timber species.

LandCare South Africa is a government initiative that aims to promote sustainable community use of natural resources while improving their livelihoods. LandCare projects are administered by NGOs throughout the country.

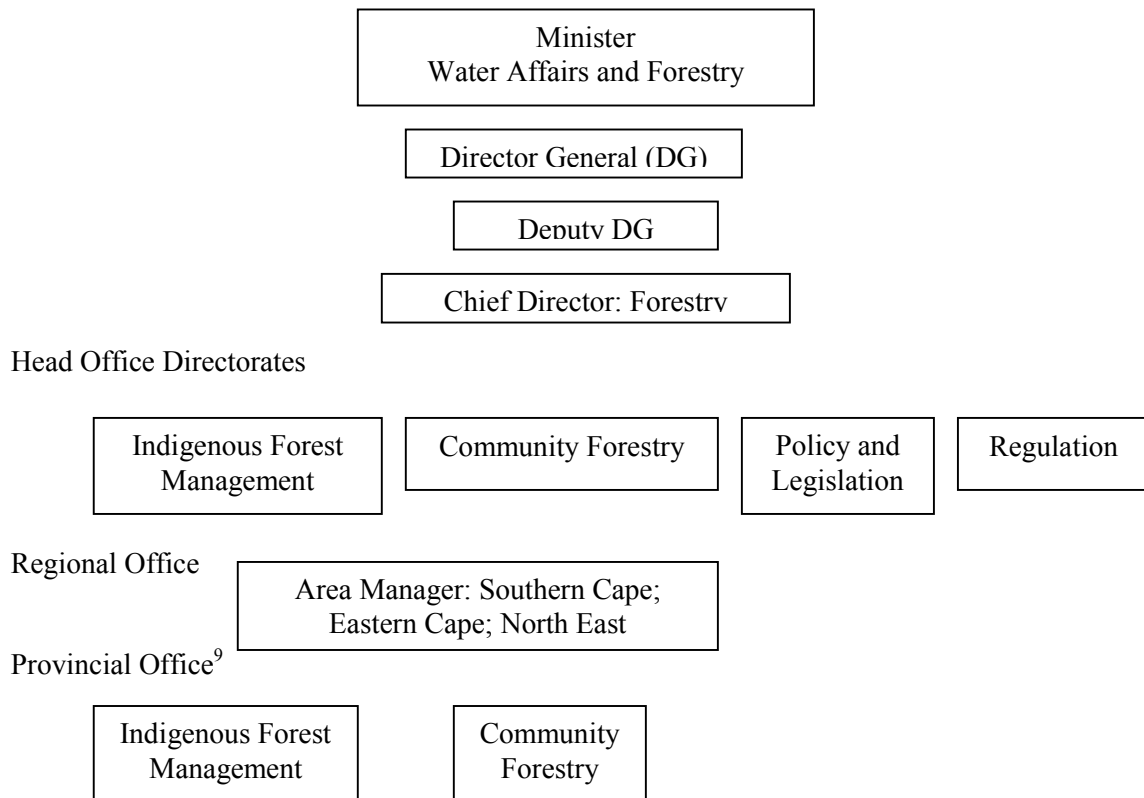
Local communities have in the past been alienated from biodiversity conservation activities as a result of the country's apartheid policies. However, a conservation ethic existed within most traditional societies, but that of the Venda peoples of the North western part of the country has remained the most intact to date. Traditionally certain species of trees were protected from cutting, and areas of forest and woodland were considered sacred. Most of these practices are no longer followed, due to the decline in traditional societies and the move to modernisation and western thinking (Khorombi, 2001).

3.5 Overview of national system of production forests, national parks and protected areas: constitutional basis, administrative structure, operational budget, and brief description of main areas and present usage

3.5.1 Administrative structure

Figures 2 and 3 indicate the administrative structure of the Department of Forestry, which has overall responsibility for the management of South Africa's indigenous state forests. The Department of Environment and Tourism essentially only has a policy-making role in forest management in the country. Each province has a provincial legislature, led by a Premier and Executive Council that passes a constitution and legislation for its province according to those activities that are considered provincial responsibilities. Each Executive Member is responsible for a separate portfolio. Indigenous forest management is considered a joint national and provincial responsibility. Nature Conservation is considered a provincial responsibility.

Fig 2. Administrative structure of the government's national Forestry Department



Within provincial governments, the provincial departments of Nature Conservation are housed in different departments, depending on the province. For example, in the Eastern Cape, Nature Conservation is housed in the Department of Economic, Environmental Affairs and Tourism. . Each Department reports to the relevant provincial MEC.

The organisational structure of those conservation institutions which are managed by Boards, such as Mpumalanga Parks Board, and KwaZulu Natal Parks Board, as well as the South Africa National Parks (SANP), all parastatal bodies which are responsible for protected area management, is slightly different. In SANP, for example, there is a Chief Executive Officer (CEO) who oversees the workings of seven different sections: Kruger Park, Parks, Conservation Development, Commercial Development and Tourism, Social Ecology, Finance and Human Resources. The overall functioning of SANP is monitored by a Board, whose members are drawn from a variety of different institutions nationwide.

3.5.2 Operational budgets

Funding for the management of forest and woodland biodiversity in the South Africa is extremely complex and difficult to ascertain. The main bodies responsible, South African National Parks (SANP), the Provincial Parks Boards, the provincial Departments of Nature Conservation, and the national Department of Water Affairs and Forestry, all have separate funding structures, government allocations and budgets. Provincial government departments require budgets to be drawn up for each forest area, which are funded accordingly. It is therefore difficult to gain a clear picture for the country as a whole. The Eastern Cape's provincial Department of Nature Conservation, which falls within the Department of Economic and Environmental Affairs and Tourism, has an annual budget of approximately R80 million, of which approximately two-thirds is spent on biodiversity conservation, in both

⁹ The provincial DWAF office does not come under provincial government.

protected and unprotected areas. The Directorate of Indigenous Forest Management, within the national Forest Department runs on an annual budget of R60 million. In 1998 SANP's budget was R 300 million, of which R50 million was government subsidy. The rest of its funds were generated through commercial activities. The national Department of Environment and Tourism (DEAT) does not allocate funding for forest management activities specifically, but includes this in its various regional project budgets.

OVERVIEW OF LINKS BETWEEN HARVESTING AND BIODIVERSITY CONSERVATION AND PLANNING

4.1 National biodiversity strategy and action plans

The country's national biodiversity strategy is laid out in the 1997 White Paper (Section 3.2). Action plans have not yet been developed (see Sections 3.2. and 5.2.1.)

4.2 Critique of monitoring and accountability systems in place

Monitoring and evaluation are considered by the Government to be essential components of both Forestry and Environmental policies. There are numerous programmes already under way to support this commitment, but there is a need to strengthen these initiatives in line with the policy objectives (DEAT, 1997). Monitoring of endangered plant species is ongoing in South Africa at present, with the Red Data species lists being constantly updated by the National Botanical Institute. Species listed by CITES as being endangered are also monitored.

In line with global moves towards sustainable forest management, South Africa's new Forestry Policy tasks the government with developing standards for sustainable forest management of closed canopy forests and plantations, together with the criteria and indicators to monitor such initiatives. This process, started in 1995, has only now been re-activated, with DWAF commissioning a group of consultants to develop standards in a participatory manner from April 2001. Significant help has come from outside – from the UK's Department for International Development in terms of funding, and from the Centre for International Forestry Research (CIFOR) in the form of advice. The C&I process, which involves a task team with members based in all the different provinces and managed by the Sustainable Forest Management committee of the National Forest Advisory Group, is to be completed by the end of the year. There are no plans to include in this initiative the development of standards for the woodland areas in South Africa.

Since 1999 a State of the Forests Report has been in the process of compilation within DWAF, with chapters having been contracted out to various research bodies, but so far there is no projected date for its completion. A State of the Environment report was completed in 1998 by DEAT, and the next stage has been to develop a list of determinants of environmental change. These will be used in future to monitor environmental degradation within the country. The process does not focus specifically on forests and woodlands. The Department of Environment and Tourism has no separate criteria and indicators for sustainable management of the rest of South Africa's flora and fauna - apart from the guidelines set out in the White Paper. There is an intention to initiate such an activity, however.

Many sceptics believe that certification of private forestry activities is a cosmetic process upon which the timber companies embark for their own economic reasons, and that it will have little real impact on the ground. Much depends on the ability of certifying bodies to

maintain their monitoring programmes, to ensure that participants maintain the standards expected of them.

4.3 Analysis of main perceived problems and constraints in linking harvesting with biodiversity conservation at the national level

4.3.1 Political

Conservation with development

With the change to democracy in the country in 1994 came a radical change in policy-making. Most important was the dual goal of sustainable use and management of the country's natural resources for development, whilst at the same time conserving the country's biodiversity assets. This brings about inevitable conflict between resource utilisation and conservation. There are still many who advocate a strictly protectionist approach towards biodiversity conservation. There is an overall perception amongst practitioners that biodiversity is gradually being eroded in favour of socio-economic benefits and equity.

Land tenure

One of the major issues still to be addressed in South Africa is ownership of land. Many of the protected areas in the country were demarcated at the expense of the local people who were living on the land at the time (Wynberg and Kepe, 1999). In the restitution process, much of the land under forest reserves will be returned to previous occupants, who have been alienated from conservation policy and implementation for many decades (DEAT, 1997). This brings economic opportunities, but also requires several constraints to be addressed, most notably those relating to the lack of skills and institutional capacity among communities.

4.3.2 Economic

With the change to democratic government in 1994, the country's focus of conservation had to be dramatically adjusted. Government departments now find themselves having to stretch their budgets over far wider areas, to incorporate the whole cross-section of the South African population. The former homeland provinces find themselves particularly cash strapped, with huge development and training needs. Paradoxically, it is often in these relatively undeveloped areas that rich biodiversity reserves are still found.

4.3.3 Social

Historically in South Africa, apartheid macro-economic and sectoral policies included controversial settlement and employment policies, and discrimination over rights of access to resources. High densities of poor people were forced to rely heavily on utilisation of natural resources for survival. Conservation measures were typically implemented to restrict access to protected natural areas, alienating large sections of the population from environmental issues such as biodiversity conservation (DEAT, 2000). The country has only had democratic government for the past five years, too short a time to reverse many of these trends.

4.3.4 Technical (managerial)

Woody resources, particularly in indigenous forests, in South Africa are limited, and relative to other government foci, management of forests and woodlands receives a fairly low priority in policy making and budget spending. In many cases biodiversity conservation is still seen as the domain of the 'greenies'. The country's biodiversity is seen as a national asset in terms of income generation through international tourism, however, and this may be the direction from which biodiversity conservation will receive most support in future. At present indigenous forests are isolated from other natural resources, because responsibility for their management falls to the Department of Forestry, rather than the Department of Environmental Affairs. With diminishing government subsidies, it makes ecological sense for these two departments to combine their efforts. Although provision is made in both DEAT's and DWAF's White Papers for greater cross-sectoral collaboration, this co-ordination is limited on the ground.

A review of the status of indigenous forest management in 2000 revealed a lack of human resources to control illegal access, particularly for medicinal products. The reasons for this are complex. In some areas there has been focus on protected areas with large mammals that will provide income, to the detriment of others (Bigalke, pers.comm.¹⁰). In other areas, like the Eastern Cape, vacant staff posts have not been filled since 1996. It is generally felt that there is better institutional functioning where provincial management boards have been set up to manage protected areas, such as in KwaZulu Natal or Mpumalanga Provinces where these bodies are parastatals with some control over their finances.

4.3.5 Biodiversity conservation per se

It has been clearly demonstrated that the species richness of ecosystems in South Africa is closely related to their contiguous surface area. This implies that continued land transformation or increased invasion of alien species will reduce species diversity, even without direct utilisation pressure on species.

PROPOSED STRATEGIES AND SOLUTIONS

5.1 Examples of failures and successes in linking harvesting and biodiversity conservation planning

5.1.1 The forest owners' guidelines for environmental conservation management in commercial forests in South Africa

The harvesting code of practice developed by FOA as mentioned in 1.6.2. above is a successful endeavour to conserve the country's biodiversity. These guidelines set out harvesting procedures to protect the indigenous vegetation surrounding plantations, in catchment areas, and in special biodiversity hotspots. One important outcome is that the risk of fire on the whole plantation is reduced.

5.1.2 Working for water

The Department of Water Affairs and Forestry's national Working for Water programme, begun in 1995, aims to rid the country of its invasive alien plant species in a bid to protect the natural biodiversity. This multi-pronged programme which has a major job-creation objective as part of the Government's Rural Development Programme, is viewed by the Department as a success story because of the number of projects it has initiated in the ground. It has also succeeded in clearing substantial areas of alien plants, and has created many thousands of jobs, secondary industries and programmes. From a different perspective, this programme can be seen as a failure, however. The programme manifests all the characteristics of an ill-conceived development project because of its largely top-down management and hasty implementation of projects, often with inexperienced staff. The major problem with the Working for Water programme has been lack of expertise, both in terms of scientific knowledge and management. There are also many examples of poor project planning and lack of foresight, where the removal of useful exotic tree species has left local communities with no alternative but to resort to harvesting in the previously protected indigenous forests. The recent introduction of consultative committees or working groups into the programme, which draw on expertise from a wide range of professionals in South Africa, should help to alleviate this problem in the future.

¹⁰ Prof. R. Bigalke, former Head of Nature Conservation and Emeritus Professor, University of Stellenbosch.

5.1.3 *Participatory forest management*

With rising population and increasing poverty, the country's forest resources are under ever increasing threat, particularly those sought after for medicinal products. The old protectionist strategies are no longer able to keep these forests from over-exploitation, and so the Government has turned to more participatory approaches in an attempt to find new ways of conserving the biodiversity.

A) Sustainable harvesting of *Ocotea bullata* in evergreen forests of Kwa-Zulu Natal and the Eastern Cape

Working with specific user groups as a management strategy has been shown to be successful in Uganda (see Wild and Mutebi, 1996), and is now being tried in South Africa.

Ocotea bullata is an indigenous hardwood found in the coastal forests of Kwa-Zulu Natal and the Eastern Cape, and is one of the few valuable timber species. It is also an important medicinal tree, however, the bark now being harvested in large quantities for commercial purposes. Traditionally, healers followed strict rules for harvesting their raw materials, particularly bark, so that they did not damage their sources. With the rapidly increasing demand for traditional medicines, a new group of gatherers has emerged which does not follow these rules, being more concerned with harvesting as much of the products as they can for a minimal investment in time and money. A survey of several forests along the country's eastern seaboard has revealed that few of the trees are left undamaged, and that there is little regeneration.

In an experimental strategy to curb the destruction of this important species, a group of researchers has begun to work with local bark collectors in the Umzimkulu area of KwaZulu-Natal to develop more sustainable methods of harvesting their products. When the whole trunk is felled instead of being ring-barked, the tree is able to coppice from the base. At the same time the harvesters are able to collect more of the bark from the trunk and branches than if they only had access from the ground (Geldenhuys, pers.comm.¹¹). Harvesters need to be persuaded of the necessity to follow these practices, however, which require more labour to fell the tree than to merely harvest the bark.

This approach to management is new, but has shown some encouraging progress to date.

B) Participatory forest management in Dwesa/Cwebe Nature Reserve, in the former Transkei of the Eastern Cape

The Dwesa/Cwebe Forests of the Eastern Cape are coastal evergreen forests containing important biodiversity reserves, the use of which has long been contested by neighbouring communities who were removed from their land in order for the Government to protect the forests. The forests were owned by the State, under the ultimate control of the Forest Department, but since the 1970s have been managed by the provincial Department of Nature Conservation. The primary source of conflict was the land on which the forests stand, as well as access to forest and marine resources.

With the change to the new government in 1994, and the major shift in policy making concerning the use and management of the country's Forest Reserves, DWAF was keen to end this conflict by involving the local communities in participatory forest

¹¹ Dr Coert Geldenhuys, independent consultant, Pretoria July 2001.

management initiatives. In a lengthy process of sometimes painful and frustrating negotiations which spanned more than five years, in an unprecedented move for South Africa, it was finally agreed that the ownership of the land should be returned to the seven communities which had prior claim to it. In the agreement, the land-use could not be changed from protected forest, however, and the community had to agree to lease the land back to the Government until such time as they have the expertise to manage the biodiversity reserve on their own.

In preparation for the hand-over, the communities were required to set up and register representative management bodies that ultimately would be held responsible for the overall well-being of the forests. This has been done. However, although agreement has been reached over the future co-management status of the Reserve, because of the focus to date on land issues, so far there have been no discussions over the technicalities of sustainable use of the forest and marine resources. The communities have high expectations of being allowed unlimited access to these resources, having been excluded from the area for several decades. The community management bodies, called Communal Property Associations, have set out guidelines for forest use, which are essentially based on principles of 'wise use' and not on any scientific assessment of the resource. They are also not followed by the majority of villagers. The forest guards, who in the past were charged with preventing local villagers from entering the forests or harvesting any resources, are no longer able to do so. The result is a management vacuum, and the villagers have taken this to mean that they can 'help themselves' to the resources they require. Some have even taken advantage of the situation to sell poles to the nearby town (Grundy *et al.*, in prep).

It is too early yet to brand the Dwesa/Cwebe participatory forest management initiative as a failure. However, this example highlights the complexity of issues involved in the transfer of management from one body to another, and the potential for failure without a major investment of time and money from the government departments involved.

5.2 Proposed strategies and solutions for improving integration of biodiversity conservation and planning into the harvesting sector

With the development of the Environmental Guidelines for private landowners, and a sense of competition to achieve good environmental practice encouraged by the timber-growing associations, biodiversity conservation in forests and woodlands is most at risk in South Africa on State-owned land. The importance of indigenous forest resources in the country is often overlooked, and because the resource is limited, it receives a low priority in national planning processes.

Indigenous forests and woodlands should not manage separately from the rest of the country's natural resources. The artificial division into government departments separately responsible for Forestry and the rest of the environment has led to dualistic and sometimes conflicting policies and planning processes.

5.2.1 Policy oriented

Whilst DWAF has powerful new legislation in place with its new Policy for Sustainable Forest Development (1996) and the enactment of the 1998 Forest Act, DEAT has a White Paper on Biodiversity, but is still in the process of developing legislation which will direct the use and management of all protected conservation areas in the country. The new national biodiversity legislation will also have the objectives of improving and harmonising existing legislation on biodiversity management, as well as giving legal effect to the relevant international conventions to which South Africa is party. In addition, DEAT's new

Bioregional approach aims to rationalise and consolidate its conservation activities for better management of protected areas (DEAT, 2001).

The overall goal of the National Forestry Policy is to promote a thriving forest sector, utilised to the lasting and sustained benefit of the total community, and developed and managed to protect and improve the environment (DWAF, 1996). DWAF's programmes have been redirected towards achieving the goals of the government's Rural Development Programme, which emphasises poverty alleviation and the upliftment of previously marginalised groups. The White paper on the Conservation and Sustainable Use of South Africa's Biological Diversity (1997) also focuses on the use of natural resources, while at the same time maintaining the country's biodiversity reserves for future generations. This focus is indicative of a worldwide shift in perception from a protectionist view to a human needs-centred view of natural resource management.

It is also a policy of DEAT to encourage involvement in international conservation initiatives such as the World Heritage Convention Act, the Man and the Biosphere programme, and other local incentives such as the South African Natural Heritage programme, as a tool to promote biodiversity conservation in the country.

DEAT is presently developing a National Biodiversity Strategy and Action Plan (NBSAP). This policy will:

- Set out long-term (5-10 year) biodiversity management strategies
- Translate policy objectives into actions with time-frames
- Address gaps in the White Paper on Conservation and Sustainable Use of South Africa's Biodiversity
- Enable DEAT to develop a coherent portfolio of biodiversity programmes and projects
- Be a tool for DEAT to strategically mobilise and deploy resources with respect to biodiversity management
- Inform capacity development needs with respect to biodiversity management
- Clarify roles of stakeholders (e.g. national and provincial government departments, statutory bodies, research organisations, universities, and non-governmental organisations).

Both the NBSAP and the new legislation will address the major biodiversity themes of conservation, sustainable use and trade, access and benefit sharing from its use, alien and invasive species and bio-safety.

Involvement of local communities in natural resource management

Both DWAF and DEAT share the view that there should be greater community involvement in management of all natural resources, including forests and woodlands, as part of their conservation with development strategy. While this sentiment may be expressed in policy documents, the enactment on the ground is still in the initial stages in many cases. Involving local people, who have been used to being alienated and ignored in the past, is not a simple procedure. Examples from the former Transkei homeland of the Eastern Cape show that it takes at least two to three years just for a conducive atmosphere of trust and dialogue to be developed before actual management procedures can be developed (de Villiers, pers.comm.¹²).

5.2.2 Economic strategies

The government's Rural Development Programme (RDP), in place since the change of government, has attempted to address the problems of the rural poor, many of whom are responsible for the local destruction of indigenous forests and woodlands. The RDP aims to invest in infrastructure, provide basic services, and create an enabling environment which will

¹² D. de Villiers, Deputy Director, Eastern Cape Nature Conservation, Dept. Economics, Environment and Tourism, October 2000.

encourage rural people to develop entrepreneurial skills and markets to promote local economic development. The RDP identifies the forest sector as have an important contribution to make in terms of job creation in rural areas, commercial forestry ventures for previously disadvantaged groups, and the generation of sustainable alternative wood supplies to remove the harvesting pressure from the indigenous forests. A thriving market in medicinal plants already exists in the country (Lawes *et al.*, 2000) but the means to control the commercialisation of the country's State owned forest resources are not yet in place.

In another initiative to encourage economic investment in rural areas, the government embarked upon its Spatial Development Initiatives (SDIs). Areas considered to be presently economically underdeveloped, mostly those in the former apartheid 'Homelands', were targeted for development through conservation and eco-tourism. As many of the SDI nodes are also sites of specific conservation value, there are moves towards including them in Biosphere Reserves, or consolidated protected areas, in an attempt to preserve the biodiversity while still utilising it for economic gain. The programme in general has suffered from a limited time horizon, lack of expertise amongst management staff, and hasty activities, however, although initial success has been achieved in some areas (Kepe, 2000).

5.2.3 Technical / managerial solutions

Participatory resource assessments

DWAF has an ambitious plan to make in-depth assessments of all of the natural resources available on their forestland in each Province, together with the local communities. They will do this in multi-disciplinary teams assigned to particular areas. Once they can map the geographical situation of the resources, they will classify the different sections of forest into management categories. Some may be kept for pure research, others for harvesting of non-timber products, a few for timber production and others for recreation etc. (N. Michell, pers.comm¹). Once DWAF has these forest types to hand, it will be able to produce detailed management plans for each area. These plans will take into account the conservation status of the forests, the resources present and the requirements of the local communities. With such detailed information, the Department will be able to allocate management of the forests to the appropriate authorities, and for the appropriate purposes. Harvesting regimes for each product will need to be developed.

Pilot projects

Many of government's initiatives to incorporate conservation into development are experimental, using new techniques. One of the objectives of the new Bioregional Approach to South Africa's Protected Areas (DEAT, 2001) is to develop and test conservation methods in pilot projects which can be fed into national policy and management processes. DWAF also has six pilot Participatory Forest Management projects which have been in place for the past three years, with the same aim. Unfortunately, in DWAF's case, all of these pilots have encountered problems due to land reform and institutional instability which have hampered progress in developing sustainable forest management strategies.

Institutional reform

The Department for Environment and Tourism (DEAT) is currently involved in developing a classification system for all of South Africa's protected areas, as part of a programme to develop better management standards. DEAT is working together with the provincial conservation departments and DWAF, among others, in this endeavour. The aim is to develop a conservation model with institutional arrangements that will encourage optimum biodiversity conservation and economic development in the area. Protected areas will then be allocated to the appropriate management body, according to its needs and conservation objectives.

5.2.4 *Human resources*

With the change in personnel in both the Department of Forestry and the Department of Environment and Tourism since 1994, each is faced with an expensive staff training programme, as it attempts to redress the training deficits of the past. This is a long-term undertaking, and one which may not always benefit government in the long term, since the private and NGO sector is able to offer better service conditions in the short-term.

5.2.5 *Biodiversity conservation per se*

Because of the increasing fragmentation of biodiversity reserves across the country, DEAT has embarked on its Bioregional approach, with the development of regional biospheres together with its Transfrontier programmes, in an attempt to maintain the integrity of forest and woodland areas even across national boundaries (DEAT, 2001).

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