

PN-ACC-112

UNITED STATES AGENCY
FOR
INTERNATIONAL DEVELOPMENT

COMPREHENSIVE ASSESSMENT OF ENVIRONMENTAL
PROBLEMS AND OPPORTUNITIES FOR USAID
INTERVENTION IN NAMIBIA

TERRESTRIAL BIODIVERSITY

APRIL 1997

NAMIBIA RESOURCE CONSULTANTS

A A FERRAR

This publication was made possible through support provided by the United States Agency for International Development (USAID), under terms of Agreement No. 673-0002-3-50036

A

Table of Contents

List of Acronyms

1.	STATE OF THE TERRESTRIAL ENVIRONMENT	1
1.1	GEOGRAPHICAL ORIENTATION	1
1.1.1	Biophysical	1
1.1.2	Socio-economic	2
1.2	MAJOR BIOMES AND RESOURCE VALUES	2
1.2.1	Major biomes	2
1.2.2	Priority biomes	3
1.2.3	Consumptive values	4
1.2.4	Non-consumptive values	4
1.2.5	Subsistence values	5
1.3	PATTERNS OF LAND USE	6
1.4	PROTECTED AREA NETWORK	8
1.5	CONSERVATION OF UNPROTECTED AREAS	9
1.5.1	Conservancies	10
1.5.2	Resource economic approach	10
1.5.3	Forestry related matters	11
1.5.4	Ex situ conservation	12
1.6	PUBLIC PARTICIPATION IN RESOURCE USE	12
1.6.1	Community involvement	13
1.6.2	The broad public	14
1.6.3	Within-agency change	15
1.7	STATE OF BIODIVERSITY KNOWLEDGE	15
1.7.1	Basic biological collections	15
1.7.2	Tools for analysis and monitoring	18
1.7.3	Research	19
1.7.4	Education and training	19
1.8	LEGISLATIVE, INSTITUTIONAL AND POLICY ENVIRONMENT	20
1.8.1	Legislation	20
1.8.2	Institutional structures	22
1.8.3	Policies in support of biodiversity	23
1.9	NGO AND PRIVATE SECTOR INVOLVEMENT	24
1.9.1	Non Government Organisations	24
1.9.2	Private sector involvement	26

2.	TRENDS AND THREATS	28
2.1	MONITORING AND THE ESTABLISHMENT OF TRENDS	28
2.2	TRENDS	28
2.2.1	Tools for monitoring	29
2.2.2	Invasive alien species	31
2.3	THREATS	31
2.4.	POSITIVE TRENDS FOR BIODIVERSITY	33
3.	IMPLICATIONS FOR USAID	35
3.1	CONSEQUENCES FOR ECONOMIC SECURITY	37
3.2	CONSEQUENCES FOR ECOSYSTEM FUNCTION	37
3.3	CONSEQUENCES FOR PUBLIC HEALTH	37
4.	CAUSES OF ENVIRONMENTAL PROBLEMS	39
4.1	DIRECT CAUSES	39
4.2	INDIRECT CAUSES	40
5.	DEFICIENCIES IN KNOWLEDGE AND PARTICIPATION	42
5.1	BIODIVERSITY INFORMATION	42
5.2	RESEARCH, MONITORING AND MANAGEMENT	42
5.3	STAKEHOLDER PARTICIPATION	43
6.	FUTURE DEVELOPMENT PRIORITY OPTION	44
7.	REFERENCES	45

List of Acronyms

CBNRM	Community Based Natural Resource Management
CITES	Convention on International Trade in Endangered Species
DEA	Directorate of Environmental Affairs
DOF	Directorate of Forestry
DRFN	Desert Research Foundation of Namibia
DRM	Directorate of Resource Management
DTR	Directorate of Tourism and Resorts
EE	Environmental Education
EIA	Environmental Impact Assessment
FAA	Foreign Assistance Act
GDP	Gross Domestic Product
GIS	Geographical Information System
ICDP	Integrated Conservation Development Project
IEM	Integrated Environmental Management
IRDNC	Integrated Rural Development and Nature Conservation
IUCN	World Conservation Union
LIFE	Living in a Finite Environment
MET	Ministry of Environment and Tourism
NAPCOD	Namibia's Program to Combat Tourism
NBFE	Namibian Business Forum for the Environment
NBRI	National Botanical Research Institute
NEEN	Namibian Environmental Education Network
NGO	Non Government Organisation
NNF	Namibia Nature Foundation
PAC	Problem Animal Control
READ	Reach Every Adult in Development
SM	State Museum
SRT	Save the Rhino Trust
UNCED	United Nations Commission on Environment and Development
UNEP	United Nations Environment Programme
WWF	World Wide Fund for Nature (Namibia)

1. STATE OF THE TERRESTRIAL ENVIRONMENT

1.1 GEOGRAPHICAL ORIENTATION

1.1.1 Biophysical

Namibia is sub-Saharan Africa's most arid and agriculturally marginal country. It comprises a land area of 824 000 km² ($\pm 1300 \times 650$ km) on the Atlantic west coast of southern Africa. It is one of the least densely populated countries of the world with about 1.6 million people (1.9 per km²) (Ashley, 1996).

In spite of its arid, near tropical climate, encompassing one of the world's oldest deserts, the Namib, its location against the cold Benguela current has a moderating effect on regional weather patterns. The result is a relatively cool but extremely arid coastal zone. The narrow coastal plain (100 - 150 km wide) extends to fringing mountains that rise to 2000 m, and on to a flat inland plateau at 1000-1200 m.

Rainfall increases from the south-west to the north-east, ranging from < 50 mm to 700 mm. Only 8% of the country receives more than 500 mm per year, the minimum considered necessary for dryland cropping.

With the exception of the extreme south-west, which can receive its sparse rainfall in any month of the year, the country falls within the summer rainfall region. In the north and east, at least 80% of the rain falls within a four-month period (December-March), while in the centre and south, 70% falls over six months.

Evaporation is well in excess of rainfall throughout the country: about 2,6m/yr from an open pan (420% of rainfall) and in the south 3,7m (1750% of rainfall). From agricultural and ecological perspectives, the most important climatic parameter is rainfall variability, which is inversely proportional to the mean annual rainfall.

In the north, the variability is about 30% while in the south and west it exceeds 70% (Namibia's Green Plan).

Mean annual temperatures in the interior of the country are mostly between 20°C and 25°C but range from below freezing to above 40°C. Coastal temperatures are cooler at about 15-20°C.

Namibia has three natural vegetation biomes: the desert (16% of the land area), the savanna (64%) and the dry woodland (20%). These biomes are further divided into 12 vegetation types. The soils, in areas where rainfall is sufficient to support exploitable vegetation, are dominated by Kalahari

sands of very low nutrient status, or by highly mineralised (saline) or rocky soils with low production potential. There are no perennial rivers within the interior of Namibia. The Kunene, Kavango, Kwando-Chobe and Zambezi Rivers are situated on the northern border and the Orange River on the southern border (Green Plan).

Most of the interior catchments are characterised by ephemeral rivers that seldom flow their full course, even after flood events, and end up in saline or underground drainage basins. Rural production and development is largely dependent on ground water - which has a patchy distribution. Access to water is the single dominant limiting factor in Namibia, both for urban and rural development and for the regions natural biota. Ground water accounts for $\pm 57\%$ of recorded water consumption, over 80% of which is used for rural and agricultural purposes (Green Plan). There are indications that non-alluvial groundwater is from fossil supplies that are non-renewable.

1.1.2 Socio-economic

Namibia has a mercantile economy growing at about 4% per year and linked strongly to South Africa. It depends heavily on exports, over two thirds of which are minerals, the remainder being livestock and marine derived products. Tourism, as the only totally renewable/sustainable export industry, has just become the country's third most important forex earner, estimated to contribute over N\$300 million to the country's GDP.

Namibia has well developed but thinly spread networks for transport and communication. The participation of people in the economy is still typically colonial, with about 5% of the population earning over 70% of the income and half the population earning about 5% of the income. Most of this disadvantaged sector of the population lives in the north, the remainder being scattered thinly throughout the commercial farming areas and other communal areas. The urban population is spread in only 18 towns of over 5 000 people each (Ashley 1966).

1.2 MAJOR BIOMES AND RESOURCE VALUES

1.2.1 Major biomes

The three major biomes of desert, savanna and woodland are defined primarily on botanical criteria and are located according to the south-west - north-east rainfall gradient. Detailed knowledge of these biomes, and their subdivisions as vegetation types, is relatively good by regional standards.

The economically active zone lies in the semi arid savannas between the Namib desert in the west and the Kalahari in the east.

The Namib desert which is almost uninhabited, stretches the full length of the western seaboard. It is divided into four regions, the north and central regions north of the Kuiseb river, the Namib sand sea south of the Kuiseb blending into the winter rainfall succulent steppe between Lüderitz and the Orange river mouth. The central plateau carries savanna vegetation (trees with grass), increasing from south to north. Dwarf shrub savanna (Karoo vegetation) in the south passes into thorn bush (Acacia) savanna in the hilly midlands and on into the tree and shrub savanna of the Kalahari in the east. In these flat sandy landscapes, the tree component increases northwards towards the Caprivi, where it develops into tropical Baobab and Pterocarpus woodland.

About 13% of Namibia's land area is set aside as proclaimed conservation areas, although these do not always conserve areas rich in biodiversity. Another 2% is protected by diamond mining exclusion laws and a further 2-4% already falls or will shortly fall under Conservancy legislation.

1.2.2 Priority biomes

At present levels of understanding the DEA's conservation priorities focus clearly on specific biomes and ecosystems (Brown 1994).

- i) **The Namib desert**, and the associated Pro-Namib (transition) Zone, is one of the world's oldest. It has scenic and spectacular landscapes and a high level of biological specialisation and endemism. It is the nation's top priority for protection, with almost the entire coastal plain protected by one or other means. Impacts on biodiversity are anticipated from mining, upstream impoundment of ephemeral rivers, water extraction from river-mouth aquifers and from uncontrolled vehicle access (Jacobson et al, 1995). Quantification has been limited to monitoring the Kuiseb and Omaruru aquifers, which have dropped to near depletion levels (Bethune, 1996).
- ii) **Namibia's wetlands** comprise a remarkably large proportion of the landscape for such an arid country (4%). They are hugely important economically as the country's most productive and biologically diverse ecosystems. Those that are habitable are the most heavily used and threatened habitats in Namibia. Where not inhabited, such as the saline Etosha complex, they provide the basis for the country's top protected area. Over one third of Namibia's population lives alongside its northern wetlands in the Cuvelai, Okavango and Zambezi-Chobe-Kwando drainage basins.

1.2.3 Consumptive values

Commercial farms are used mainly for livestock, but as rangeland has deteriorated and livestock numbers declined and as conditional ownership over wildlife has been transferred to farmers and wildlife values have increased, and they are being used increasingly for tourism and wildlife production. Eighty percent of the country's big game populations occur on these properties. A measure of the direct value of indigenous species is that the wildlife and tourism industry on commercial farms has grown steadily at approximately 3% per annum over the last 20 years, with an aggregate economic value in 1992 estimated at N\$56 million (Barnes and de Jager 1995). This game farm industry generated over N\$30 million in 1991 (Green Plan).

The value of privately owned wildlife assets has grown substantially since Independence and is now probably worth two to three times that amount. In recent years game farm owners have started to acquire very high-value species such as elephant, rhino, lion and buffalo. These animals can cost over N\$50 000 each (black rhino as high as N\$ 250 000).

Community based tourism projects are restoring the value of wildlife to local people and to Namibia's thriving tourism industry. A measure of Namibia's potential dependence on biodiversity through its nature based tourism industry may be obtained from the following projections by Holm-Petersen (1996): the anticipated total foreign exchange earnings from tourism as a whole are estimated to reach N\$1 billion within the next four years, with the creation of about 20 000 jobs. The size, the spread and the potential of this industry, is obviously of great significance in linking biodiversity to the country's economy.

1.2.4 Non-consumptive values

Traditionally all wild species of value have been used in the communal areas. Wildlife populations are still in good condition in the sparsely inhabited regions. Of particular importance in the north western desert region of Kunene are the populations of black rhinos and elephants that have been increasing satisfactorily in the last five years. These desert adapted ecotypes are flagship species for the tourism economy of the region as well as having high genetic and ecological value. The country's rhino populations are sufficiently important that they rate a single species management plan. These plans set population targets, distribution guidelines and policies on research, monitoring, dehorning, translocation and sale for both species (Erb, 1996). The successful protection of the desert black rhino during the South African military occupation, by means of community game guards, has been one of Namibia's most notable conservation success stories.

Namibia is also home to about 8 000 free ranging elephants, mostly occurring outside conservation areas. Elephant range coincides with some of the densely populated areas of Okavango region. A unique feature is that their range occupies the driest (North Namib) and the wettest (East Caprivi) areas of Namibia. Detailed management plans have also been drawn up for this species, setting population estimates, carrying capacities and other guidelines for each of five defined elephant ranges across the northern regions. The basis of elephant management is that their fate will be decided by the people who share their space. If they are valued by them they will survive. If not elephants will not survive because the conservation areas are not large enough to support them without access to communal lands.

In addition to these high value species, Namibia's record in conserving endangered predators such as the cheetah and the Cape hunting dog is a matter of some pride. In the case of the cheetah the creation of a lively market for the animal, both as a trophy and for live sale, has undoubtedly saved what otherwise would have been yet another stock-thief extinction. A major factor in the continued presence of both these wide ranging species is the maintenance of very large areas of wild, unpopulated country with viable prey populations.

1.2.5 Subsistence values

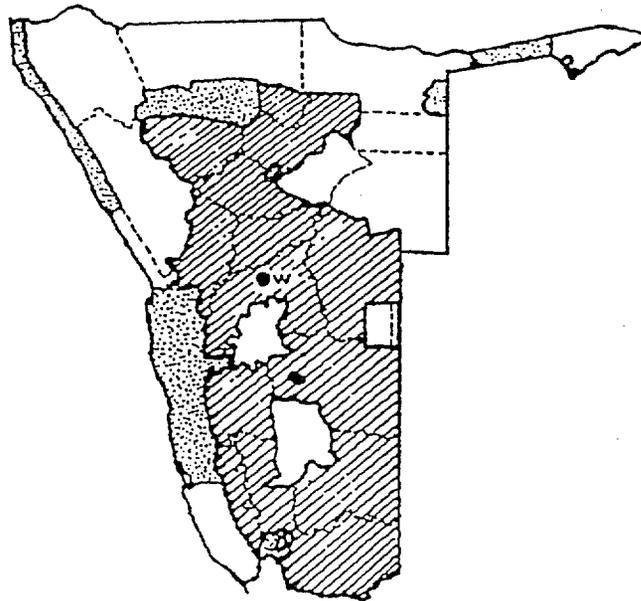
Considerable work has been done to document the subsistence uses of indigenous wild species in the northern regions. Marsh and Seely (1992) document the more important food and fibre plants used in Oshana region and Barnes (1995b) allocates net economic values to the main non-agricultural goods obtained from wild resources in various northern provinces. If these consumptive wild resource values are added to revenue generated from non-consumptive tourism in the same areas, the net added value per annum was calculated at, N\$260 per km² for Caprivi, and N\$12 per km² for former Bushmanland. The Kunene region generated figures of between N\$25 per km² and N\$35 per km² in the same study. These are very substantial economic gains when the large size of the areas and the small numbers of residents are taken into account. No account was taken of non-use values, some of which may be significant. These resource economic studies provide a sound basis for planning for consumptive and non-consumptive tourism. They also indicate the potential for these values to increase at existing resource levels. These potential increases vary from 2.5 to 5 times present net values.

1.3 PATTERNS OF LAND USE

There are three basic forms of rural land tenure in Namibia:

- 44% commercial farming or freehold land (362 000k2)
- 41% State owned communal tenure land (335 400 km²)
- 15% State land nature reserves and protected areas (111 800 km²)

Figure 1 Land Tenure in Namibia. Source Brown, 1992, p. viii



Land tenure in Namibia; proclaimed conservation areas (stippled), commercial farmlands (hatched) and communal farming areas (unmarked).

The colonial land tenure system and the low productivity characteristics of the landscape have given rise to this distinct and polarised pattern of land use. The arid deserts and conserved areas are largely unpopulated and to some extent self protecting - threatened only by ill-advised development or uncontrolled tourism. The densely populated patches within the communal lands have suffered from deforestation, desertification and erosion, with serious reduction of biodiversity. The freehold commercial land, lightly populated by people but heavily stocked with domestic grazers, displays a more subtle and uniform response to human use.

Namibians are strongly dependent on their living natural resources. Only one quarter of the population is urban and industrially based (including mining), the remainder lives in rural areas. Here people depend directly on biological resources, both financially and for essential goods and services (Brown 1996). The distribution of the rural population is very skewed. The commercial farmland is divided into $\pm 6\ 300$ farms belonging to $\pm 4\ 200$ farmers and occupied only by

these farmers, their dependants and employees. Over 60% of Namibia's population live as subsistence farmers in communal lands, over 85% of which are located in the north, concentrated in the well watered areas of the former Owambo, Kavango and Caprivi. The remaining 15% of the country, comprising mainly the coastal plain of the northern and southern Namib and the Etosha National Park, are virtually uninhabited. Note - there are also uninhabited areas in the Communal areas e.g. parts of Kunene and Erongo (because of its aridity), parts of Hereroland and Kavango (because of lack of surface water).

Commercial farmland is used mainly for large and small livestock production in extensive but fenced land units of 5 000 to 10 000 ha. Communal areas which carry over half the country's population are only occupied where water and grazing are available, mainly in the extreme north. There is no provision for group or individual ownership of land or resources in these areas. With a history of State ownership of all communal land and resources, central planning and lack of local accountability, there are predictable results. There is widespread environmental degradation and unsustainable development in the heavily populated, northern communal lands.

Within the different land tenure systems, the ultimate determinant of land occupancy has always been the availability of water - usually ground water. Within the land use characteristics of freehold and commercial land, wherever water has been most abundant, there has been the most intense land use, e.g. the Grootfontein karstveld aquifer and Cuvelai drainage in the former Owambo. These have become centres of the worst bush encroachment and worst deforestation respectively (Bester, 1996; Marsh & Seely, 1992). A major impact of the provision of pumped water supplies is that it has caused livestock to become sedentary where even in recent times there was a tradition of transhumance. This loss of flexibility increases the likelihood of biodiversity loss, especially in respect of other competing herbivores. In the far north where foot and mouth disease is a threat to cattle, veterinary protection of the livestock industry compounds the ecological impact of boreholes and cattle (Marsh & Seely 1992). The fencing programmes of the veterinary and conservation authorities north of Etosha contributed to the decimation of wildebeest and other migratory wildlife populations.

A subtle form of protection against land abuse, has been the need for increasing control of access to the Namib desert. The increasing use of 4x4 vehicles having uncontrolled access to the 1000 km coastline and its fringing desert brings vehicle damage and littering to these ancient and sensitive land surfaces. Apart from the impact of the Walvis Bay/Swakopmund complex, which is mainly as a result of water demand, the only other significant impact on the desert has been from uncontrolled and badly behaved visitors. The impacts have been small but highly visible and probably long lasting. Reaction to these pressures on the country's prime wilderness is turning a relatively small threat into a great opportunity to teach Namibians and visitors about their fascinating and precious environment. Areas that can hardly sustain life can certainly sustain tourism.

1.4 PROTECTED AREA NETWORK

Namibia's protected area network was never planned to conserve biodiversity (Brown, 1996). It is probable that protected areas were formed initially in response to tourism demand and latterly in response to the threat of tourism impact in delicate desert ecosystems (Schoeman, 1996). As with parks in most of Africa, the emphasis has been on big game and scenery. The categorisation of parks according to defined management objectives for biodiversity, does not seem to have been a major issue in the development of the protected area system. There is only one National Park that fits comfortably within the international use of the term, namely Etosha. Other protected area labels - park, game park, game reserve, recreation resort etc, are used without much consistency (Baker, 1996).

Namibia has 21 proclaimed protected areas totalling over 13% of the country. Three large desert parks along the coast, together with Etosha National Park make up over 85% of the total protected area. Additional protection of the Namib Desert is provided in the form of Diamond Area No 1 north of Oranjemund, which encompasses another 25 000 km². This must make the Namib the most comprehensively protected desert anywhere.

If the small parks, whose primary function is recreation, are discounted, then there are eleven protected areas contributing significantly to biodiversity conservation in Namibia. The large protected areas are open systems, with the exception of Etosha National Park, which is comprehensively fenced to prevent all large mammal movement across its borders, including elephants and predators. Etosha is fenced as "game proof" in south, west, east and north west, but large areas in the north are only cattle fenced. Elephants move out seasonally. The Namib-Naukluft Park is fenced along its entire border with commercial farms. The Waterberg and Etosha Parks have a history of fairly intensive resource management, with wildlife species being re-introduced after local extinctions and other populations being manipulated to meet management goals.

There have been high levels of protection and resource management in Namibia's parks. Some would describe it as excessive intervention in parks such as Etosha where high speed road design (with 60 km/h speed limits) and village-size visitor and administrative developments have been built.

Waterberg was specifically established for reintroduction of rare and endangered species in other areas of Namibia, through reintroduction and breeding. For example species from Caprivi (Roan, Sable, Tsessebe) and other endangered species (Buffalo, Eland, Rhino), were established there under the best possible conditions for reintroduction for farms - to promote wildlife-based industries and re-establishment of biodiversity. There are no high speed roads in Waterberg (in fact, few visitors are allowed onto the plateau and none unescorted) and the camp (tourist) is a peripheral development below the plateau. The focus has always been on big game and its presentation to visitors. Where possible people were excluded,

both as residents and as beneficiaries. This situation changed at independence in 1990, and although resource management of formal parks has not changed much, new parks with more flexible policies have been added to the protected area system. In this regard the development of conservancies and community based tourism projects are very positive developments. With the likelihood that a comprehensive formal park network will be unattainable, it is very important to have alternative, partial protection strategies to broaden the basis for sustainable use of Namibia's rangelands.

It has long been a generally accepted principle of conservation that the main purpose of any protected area system is to preserve a representative sample of major biomes. It is stated that Namibia's protected areas represent 13 different biomes (Baker 1996). This should be interpreted to mean vegetation types, as only three biomes are generally recognised in the literature (Burke, 1996 and Green Plan). The claim is dubious because of the lack of consensus on the description and distribution of Namibia's vegetation types. Certainly the three large vegetation types - Dwarf Shrub Savanna; Camelthorn Savanna (Central Kalahari) and Mixed Tree and Shrub Savanna (southern Kalahari), totalling about 30% of the country, are not represented in protected areas at all.

In MET's mission statement and objectives, there is no recognition of biodiversity existing at the ecosystem or habitat level. There is no statement that the protected area network is the very foundation of biodiversity conservation (DEA, 1994c). Although this may be seen as a bureaucratic detail, it is evidence of confused policy and planning when it comes to park management. Recognition of the role of ecosystem diversity, diversity of plant communities, habitat dynamics and patchiness, all as part of biodiversity, is of particular importance in variable, arid landscapes. These issues are recognised by MET's planners and ecologists (see penultimate page of the Green Plan), but even now after five years of policy review they are absent from the Ministry's most public documents (DEA, 1994a and 1994c, Barnard, in prep). This deficiency (oversight?) is particularly important where clear understanding for co-operative actions between agencies is essential and where new and relatively inexperienced staff are moving into management positions.

1.5 CONSERVATION OF UNPROTECTED AREAS

The most significant progress in the implementation of biodiversity conservation since Independence in 1990, has been to focus on areas outside the formal protected area system. In the 1960's, ownership rights to wildlife were given to commercial farmers (Schoeman, 1996). This resulted in substantial financial incentives to conserve game and, by association, their habitats too. This took place at the time of rising interest in nature based tourism, the decline in East African safari hunting and a deterioration of local rangeland through mis-management of livestock. It was a far sighted decision at a fortuitous time.

1.5.1 Conservancies

The change of government after the Angolan/South African war, and the return of tourism to northern Namibia, drew attention to the need to provide similar wildlife protection incentives to residents of communal land. This had for some time been the objective of local NGO projects. It became the chief focus of USAID funding in what is now the LIFE Project, in support of the Community Based Natural Resource Management initiative of MET. It has culminated in the promulgation of an Amendment to the Nature Conservation Ordinance of 1975, to provide for:

“an economically based system of sustainable management and utilisation of game in communal areas “

More specifically, it provides for the creation of conservancies, or areas, demarcated by resident communities, with rights to derive benefits from the use of their own wildlife. Conservancies already exist in commercial farmlands and one or two de facto communal land conservancies have been operating for some time with the help of local NGOs (Owen-Smith, 1996). The short coverage of biodiversity by protected areas in Namibia calls for more of these innovative approaches to conservation. With about 70% of the country's valuable wildlife populations (big game) occurring outside the protected area system, there are widespread opportunities for creating economic incentives to promote sustainable use. Conservancies are dealt with in more detail in the section on public participation.

1.5.2 Resource economic approach

A critical success factor in the implementation of conservation and sustainable use programmes in areas outside the protected area system, has been the adoption of a resource-economic approach. Laying emphasis on the financial and economic values of resources and environmental services and the placement of a strong professional team of resource economists at the heart of the policy making and planning apparatus has proved to be a wise and effective investment. It has enabled complex environmental management issues to be reduced to the simpler language of costs and benefits. It has provided an alternative to the often esoteric language of biologists, ecologists and conservationists, whose complex and often fuzzy values systems and priorities require a scientific training and a first-world perspective.

Economists and social scientists talk the language of politicians and governments. With increasing democratisation, especially for disadvantaged people, the new people-orientated approach to biodiversity conservation has become the pre-eminent feature of the nineties for resource management agencies. In Namibia, at least at the policy and pilot programme level, this

has been a success story of note. On the implementation side it is only fair to withhold judgement for a while. The combination of the need for slow participatory processes to be used within communities and for the sometimes even slower organisational changes needed in state management agencies, requires patience and stamina. In its simplest terms it requires a focus on capacity building, training and re-training, mainly by on-the-job experience.

1.5.3 Forestry related matters

Forestry in Namibia relates to the sustainable management of woodlands and woodland resources. There are no forests in Namibia. Certainly not in the sense of the popular understanding of the term, typified by the familiar images of tropical or temperate forests, which are the images most familiar to northern hemisphere residents. Namibia has savannas and woodlands growing in semi-arid and dry, sub-humid environments. Species are largely slow growing hardwoods, with only two or three species having commercial timber value. There is evidence that the extraction of Zambezi teak, *Baikaea plurijuga* and *kiaat Pterocarpus angolensis*, under remote, loosely controlled situations such as exist in Caprivi, causes permanent changes to these marginal woodlands, sufficient to prevent their regeneration. Where timber extraction has been practised in these woodlands in neighbouring countries, it has been abandoned or at least acknowledged as unsustainable.

Other forestry related issues include the non-commercial uses of wood (structural wood, firewood, carving) and non-timber related uses of woodlands (tourism). The matter of afforestation and provision of pilot woodlot schemes also falls within the forestry mandate. Given these circumstances and the limited scale of some of the forestry activities, it is somewhat surprising to find there is a full Directorate of Forestry. Their area of responsibility in geographic terms and in terms of the type of management issues tackled, overlaps with the mandates of other directorates within MET. Issues that have little to do with commercial forestry could probably be more efficiently handled within the context of existing CBNRM and related conservation and community development initiatives.

As the Directorate is in a process of strategic review and the possibility of institutional restructuring is part of the process (Schumann, 1996) it is not very useful to introduce what can only be fairly superficial comments into the debate. It is sufficient to say that the management of the woody biodiversity of Namibia has more in common with the principles and practices of multiple resource management and community development than with any specific notion of forestry management or timber production. To illustrate the point; the indigenous sawnwood industry worries about

finding more raw material to bolster the declining railway sleeper trade and bring sawmills up to capacity (Siyambango, 1996). The resource base comprises high quality hardwood species of marginal productivity that could be sold exclusively to the furniture trade for much higher prices. Other sources predict Namibia will no longer be self-sufficient in wood within a decade (Ashley, 1996).

A rational approach to the management of woody resources is best developed through a resource economic approach of valuing forest products appropriately to achieve best possible returns or benefits. This applies as much to commercial timber extraction as it does to the control of access to forest products for domestic use, which functions outside of any sort of market. Again this approach is identical to that of access to other renewable natural resources in communal lands. The conservancy legislation appears well suited to address such issues and should be targeted for implementation in areas where woodland resources dominate.

1.5.4 Ex situ conservation

In the matter of ex situ conservation, the propagation of indigenous plants and animals in botanical or zoological gardens, there is little scientific or commercial interest or state support for such initiatives. The apparent low priority afforded to zoological propagation is appropriate in a developing country where it is so much more cost effective to prioritise in situ conservation. The situation is different in respect of plant propagation. There is a demand for indigenous plants: for cultivation (succulents); for urban improvement; for diversifying domesticated species in rural areas; and for ecosystem restoration. There is active NGO and state support for the propagation and distribution of tree seedlings and other valued (food) plants to disadvantaged people. There is scope and probably economic incentives to extend these activities considerably. At the genetic and tissue level of biodiversity preservation, there is a tissue culture laboratory attached to the NBRI but no specific programmes are known to be operational as the facility is brand new.

1.6 PUBLIC PARTICIPATION IN RESOURCE USE

The role of a protected area network provides only part of any strategy to protect biodiversity. At least an equal amount of energy must be put into the rest of the landscape through sustainable development programmes if acceptable levels of biodiversity conservation are to be achieved. The key to this aspect of the task is public participation. This is well understood by policy makers and planners in DEA. It is less relevant and probably less well understood by bureaucrats generally, technical and scientific staff and possibly also by management agency personnel,

especially where they have been used to a more authoritarian style of carrying out their duties.

There are three categories of participatory activity that deserve comment:

- i) Involvement of **local communities** in decisions about the use of resources in their place of residence.
- ii) Involvement of **the broad public** in the policy making and planning work of government, developers and aid agencies. This includes the difficult area of intra-governmental co-operation and communications with interested and affected agencies.
- iii) Participation of all personnel within state agencies where resistance to organisational change is a major factor affecting implementation of new policies and programmes.

1.6.1 Community involvement

A focus on community involvement and empowering local people to take responsibility for their own resources, in exchange for receiving benefits from their use, has been the principle focus of the CBNRM programme supported by the LIFE Project. Community participation has been mandatory and generally successful where projects have been implemented.

Jones (1993) indicates situations in which community involvement has been successfully obtained:

- NGO initiated community game guard and tourism levy programmes in the Kunene region, specifically with the communities of Sesfontein and Purros. Now spreading to the Caprivi region.
- MET programmes, assisted by NGOs, to integrate the interests of communities resident in protected areas and to link community development to sustainable resource use. The Topnaars of the Kuiseb and the San of the Western Caprivi have been extensively involved in this process since soon after independence.

All of these activities are referred to as Integrated Conservation Development Projects (ICDPs) having the common purpose of linking the conservation of biological diversity to local social and economic development. The recently developed Conservancy concept, has great potential to assist ICDPs and improve the lot of rural people. It has been developed from the positive experience of creating conservancies in commercial land in Namibia and from insights gained through local socio-ecological surveys (Biesele and Jones 1991, Brown and Jones 1994, Jones 1993). It has also benefited from extensive comparison with other policy developments internationally (Jones 1995). The result is a very

thoroughly worked piece of legislation which is designed to build a network of interlocking ICDPs with responsibilities and benefits devolved to local community structures. It involves state agencies, NGOs and the private sector. Now that the enabling legislation has been approved it requires only the test of implementation. Having been thoroughly worked on through public participation at both the policy and grassroots level it stands an excellent chance of success.

The potential biodiversity gains from the success of this initiative are obvious. However there will be negative consequences resulting from development and it is never too early to start thinking about them. With community development comes growth and immigration. Defining and limiting the size of the beneficiary community is a domestic issue, but assistance will be needed to provide outlets for those who do not wish to retain the rural way of life. With a history of measuring affluence in terms of livestock, to persist with the custom may be incompatible with sustainable resource use. Even the preoccupation with materialistic western lifestyles, once revenue is available, may erode the traditional values that form the foundation of ICDPs. Success may release the state from its resource management burden but it will surely be replaced in full measure with one of managing social development.

1.6.2 The broad public

This term is used in the sense of creating opportunities for general participation by all who can be reached by the media and other forms of communication, on issues that are of public interest. It also refers to inter agency communication within the bureaucracies of government and commerce and industry and other interest groups. It is a form of participation typified by the process of Integrated Environmental Management, where all interested and affected parties must be given the opportunity to be involved. The parties to a potential development must be given the opportunity to have access to information, understand the issues and express their views to decision makers. In this context the Namibian Environmental Assessment Policy (DEA, 1995a) not only makes these provisions but requires them to apply equally to projects, plans and policies.

The extent to which this participatory process has been implemented is not directly known. In matters to do specifically with biodiversity, the group of specialists is small and known to each other, making communication simple. For broader policy issues there are indications that the obvious and positive interest groups are thoroughly consulted but that there are others who are not or, if they are, they do not participate. There were strongly positive but also negative opinions about the extent of participation in DEAs new policy initiatives. Although some parties are being left out of the process, the net

balance is clearly positive. No assessment was made of any attempts to use the public media to enhance the participation process.

1.6.3 Within-agency change

This issue was not examined specifically but incidental observations deserve mention. It is also a sensitive issue which may fall outside the mandate of this review and outside the area of interest of USAID. In the belief that this is not so on both counts, the following is offered.

There was evidence of communication failure on behalf of USAID and DEA in the conduct of our interviews and information gathering. Key people and agencies with responsibilities for issues within the mandate of this review were not even aware of the project. This may be mere oversight and of little significance in view of the somewhat bureaucratic and administrative motivation for the work, but it is felt that it indicates more serious flaws in the aid - recipient relationship. DEA and USAID have "found" each other and developed a shared vision for development. DEA has the expertise to respond to it and build on it. Associated agencies (DTR/DRM?) are relatively un-involved and are likely to become increasingly marginalised or left behind in the change process. A gap will then develop between policy makers and implementers which will be widened by neglect and inter-agency politics. If it is not addressed, the possibility of avoidable policy failure looms.

1.7 STATE OF BIODIVERSITY KNOWLEDGE

1.7.1 Basic biological collections

Namibia has a reputation for biological curiosities such as *Welwitschia mirabilis*, and an abundance of other interesting and spectacular species. Cryptic desert succulents and desert elephants and rhinos have generated a strong interest in the area from taxonomists through the last century. This has resulted in a fairly well documented flora, although it is far from complete. Some of it is in the hands of foreign taxonomists and their institutions. Faunal biodiversity is even better known, with terrestrial vertebrates (especially mammals and birds) being well documented. The invertebrate fauna is much less well described (estimated at 5% documented) with large gaps and poor knowledge of biogeography (E griffin, pers com). Micro-biota, outside of those that are economically important for agriculture, have been minimally documented.

Local institutions such as the National Botanical Research Institute (NBRI) and the State Museum (SM) have built up substantial systematic collections and databases of the country's wild species. In addition, there are large collections of Namibian material at prominent foreign museums, universities

and research institutes such as the Missouri Botanical Garden, Royal Botanical Gardens at Kew, International Plant Genetic Resources Institute, Alexander Koenig Museum, British Museum (Natural History), Royal Swedish Museum of Natural History, Vönersborg Museum, South African National Botanical Institute and the South African Museum.

Major databases on biodiversity are held at the following Namibian institutions:

Ministry of Environment & Tourism (Directorate of Environmental Affairs, Directorate of Forestry (including the National Remote Sensing Centre), and Directorate of Resource Management (Research Section)).

Ministry of Agriculture, Water and Rural Development (National Botanical Research Institute, comprising the National Herbarium, Vegetation Survey, Tissue Culture Laboratory, Botanical Garden and National Plant Genetics Resources Centre); also Department of Water Affairs (Ecology Section of the Research Division).

Ministry of Education & Culture (State Museum of Namibia)

Ministry of Fisheries and Marine Resources (Fisheries Research & Information Centre and Hardap Freshwater Fish Institute)

Desert Research Foundation of Namibia (Desert Ecological Research Unit)

Namibia signed the Convention on Biological Diversity at UNCED, on 13 June 1992. The process of ratifying this convention and implementing its required actions, has provided the initiative and guidance for the production of a National Biodiversity Strategy. As the basis for the Strategy and in keeping with the provisions of the Convention, DEA is presently undertaking a UNEP-style National Biodiversity Country Study. The planning and implementation of this study, is being steered by a cross-sectoral body known as the National Biodiversity Task Force. This body is chaired and co-ordinated by DEA which supports a full-time professional biodiversity programme co-ordinator (Dr P Barnard).

Namibia's biodiversity collections and data bases may be in relatively good shape, but the question needs to be asked, — *are they useful and are they used?* They are judged to be good (but incomplete, uncollated and not easy to access) by scientists who are themselves familiar with them and can access them up to a point. To the general public, material on large mammals, birds and possibly trees seems comprehensive (there are popular guidebooks) the rest is a mystery. The task of turning this information into formats for the general public and for educators and trainers has hardly been started. To those who work in the institutions mandated to complete

and maintain these databases (SM and NBRI) the task seems impossible due to lack of expertise and funding. The State Museum has reduced its curator staff by 50% since 1990. Many of the remaining eight curators have had to spend much of their time single-handedly computerising their collections over the last four years. The NBRI is also understaffed and there appears to be some confusion as to how it should respond to those who wish to use its products.

As far as biodiversity interests are concerned, MET requirements are for distribution-data and more specific information on rare and endemic species and species with particular economic value. Their requirements as far as resource management is concerned, go well beyond the inventory function of compiling primary taxonomic and biogeographic data. In recognition of this need DEA has placed two biological information initiatives on its Twelve Point Plan (Brown 1993). They are,

- Point 5. **Biodiversity Information Systems**
to make biodiversity information more accessible and to co-ordinate research, monitoring and publication activities

- Point 7. **Regional Environmental Profiles**
to provide GIS based information for regional planning, physical development, resource conservation, CBNRM and other projects.

As these are intended to be tools for planners and managers, some of whom will not be MET employees, it is important that the format and content of these databases are decided through the necessary process of customer participation.

Important geographic parameters of biodiversity are measures of species richness and concentrations of endemics. These are often referred to as "hotspots". Centres of biodiversity and endemism can only be very rough approximations, based on current information. The most useful information is botanical, where the following "hotspots" are indicated (Maggs et al, 1994):

Biodiversity - the southern Namib, the Grootfontein Karstveld and the Kunene (Kaokoveld) region. The Caprivi (and Kavango) region also has high biodiversity that is important economically for tourism. This area is less significant from a biological point of view, as it represents a thin slice of moist Central African biota that is very extensive outside of Namibia.

Endemism - the Namib, especially the central and northern regions, holds most of the known centres of endemism. This area includes the escarpments and mountains lying between the desert and the interior

savanna plateau. Along with specially adapted endemics with general distribution in the Namib, there are isolated topographic sites i.e. isolated springs, kloofs, caves and inselbergs, often in self-protecting sites predisposed to the occurrence and persistence of endemics.

These approximate distributions need to be verified and refined. Once established they may require further innovative approaches to achieve species protection including cultural approaches, visitor controls and even information censorship in highly vulnerable sites.

1.7.2 Tools for analysis and monitoring

MET employs, through the Division of Specialist Support Services (DRM) a full-time biodiversity ecologist, Mr M Griffin, who is involved with zoological inventory and the collection of data for the production of Red Data Books. Red Data Books, which are important baseline publications on threatened and endemic species, are currently at an advanced stage of preparation for birds, mammals, reptiles and amphibians. Future Red Data Books are envisaged for plants and some groups of insects.(Barnard et al, in prep). The role of Red Data Books in monitoring is dealt with in Chapter 2.

The production of the Country Study will sharpen the focus on priorities and gaps in knowledge and will also achieve a measure of co-ordination between data collecting agencies. Publication of the Country Study is expected shortly. Several draft chapters and the planned Table of Contents were made available for this review (P Barnard, pers com). The production of the Country Study will provide the full and comprehensive review of future priorities that this document seeks to summarise in advance.

The pattern and spatial distribution of biodiversity at the scale of ecosystems and habitats is not well documented. The national vegetation map is 25 years old and was admitted to be inadequate and inaccurate at time of publication (Giess 1971). Specific needs for landscape scale mapping have been tackled by projects in several state departments (Geological Survey, Directorate of Forestry, Directorate of Resource Management) mostly based on remote sensing technology. These have been of little value outside of their sometimes narrow purpose, and may well be using inappropriate technology for the broader needs of resource managers and biodiversity monitoring.

A welcome initiative to develop an agro-ecological map of Namibia, initiated by the Ministry of Agriculture, Water and Rural Development may prove to be a more useful tool. It will seek to define landscape types, combining available and often inadequate data on topography, soils, climate and vegetation (EF de Pauw, pers com). This type of use of multi-disciplinary data: selected from what is available; collated and blended with the

experience of field managers; to meet the needs of a wide spectrum of decision makers; is likely to be of great value. In this case the decision makers are land-use planners, who, in this era of democratisation and public participation, are a very large and non-technical user group.

1.7.3 Research

The MET has recently revised its research policy and restructured its staff. In the past, researchers were left more or less to their own devices in selecting and carrying out research work. Projects were confined mainly to wildlife and its management, but not always in line with management needs (Lindique, 1996). Because of these changes there is little value in reviewing the past track record. It is sufficient to say that the research policy examined (undated) is very all-inclusive and does not provide clear direction or priorities. In general terms the new direction is intended to firmly link research to management. This will widen the scope of research to include all wildlife resources outside of parks and the associated social and economic research needs, along with the more familiar application of park management and monitoring.

Sixty percent of the research effort is placed in resource management, in all regions and protected areas, a further 30% is involved directly in country-wide biodiversity and conservation matters. A small, Windhoek based group has the mandate to monitor trends in the wildlife utilisation sector. New, comprehensive project management protocols will apply to all these groups, including visiting, externally funded researchers. The protocols are intended to develop a more disciplined user-orientated research effort, in a support role to the mission of MET and to the wildlife and tourism industry as a whole.

1.7.4 Education and training

The ultimate measure of the state of biodiversity knowledge, is in the extent of understanding of environmental issues among the general public and, specifically, those responsible for environmental management. The mechanism whereby citizens become environmentally literate and empowered to make better decisions about their living conditions, is through Environmental Education (EE). The formal contribution into EE on the part of state agencies has not been evaluated.

EE activity in Namibia is soundly based from both a philosophical and an organisational point of view. It is an informal, multi-organisational and multi-disciplinary network. It appears to be driven primarily by NGOs who have universally recognised the need for a strong educational component to all environmental programmes. The networking modus operandi has developed through NEEN (Namibia Environmental Education Network) which

is itself developing a National EE Policy. This level of professional and public participation bodes well for EE development. No information was obtained on the role of MET in promoting EE, other than its provision of park-related visitor information facilities and materials. It is understood that there are visitor centres at Waterberg and Etosha National Park and that there are MET extension staff in "all regions", though no information was obtained on the nature or extent of their activities.

No information on the training of MET staff was obtained. Comments from several sources on the shortage of tertiary-trained personnel were received. There is obviously a need for training of inexperienced staff, especially if there is an affirmative action policy. In-service training and re-training will always be a priority where new policies and functions demand new skills. These issues were not mentioned during interviews, which raises the possibility of a serious gap here in the information needed for more effective natural resource management in Namibia.

1.8 LEGISLATIVE, INSTITUTIONAL AND POLICY ENVIRONMENT

The dramatic extent of biological degradation in the densely populated former Owambo region was a shock to President Nujoma and his exiles, returning at Independence after an absence of 20 years. This was a significant factor in the formulation of Namibia's environmentally progressive constitution (Tarr, 1996).

Namibia's Constitution (1990) is one of the most environmentally progressive documents of its kind. Article 95 contains the biodiversity conservation principles articulated in the global environmental policy document, Caring for the Earth (1991).

1.8.1 Legislation

Namibia's environmental legislation is largely outdated, badly fragmented and incomplete. There needs to be a full review of this legislation, including the Wildlife Ordinance (4 of 1975).
(Brown, 1994).

The need for a detailed law reform process has been recognised and is currently underway (Corbett and Glazewski, 1996). The first product of this review that is designed to have a positive impact on biodiversity, is the recently passed Nature Conservation Amendment Bill of 1996. It is aimed at providing for the establishment of conservancies in communal areas, thereby conferring ownership rights of the areas wildlife resources on the local people who live in the area.

Other Acts of legislation that have direct impact on the country's renewable natural resources are,

- Water Act (No 54 of 1956)
- Artesian Water Control Ordinance (No 35 of 1955)
- Forest Act (No 72 of 1968)
- Preservation of Forests and Trees Ordinance (no 37 of 1952)
- Nature Conservation Ordinance (No 4 of 1975)
- Minerals (Prospecting and Mining) Act (No 33 of 1992)
- Petroleum (Exploration and Production) Act (No 3 of 1991)
- Sea Fisheries Act (No 29 of 1992)
- Foreign Investment Act (No 96 of 1990)

Corbett and Glazewski (1996) provide a list of 23 other Acts that have indirect impact on the environment. Many of these laws have been inherited from South Africa and are outdated and inappropriate. The present review of environmental legislation, its progress and intentions are set out in some detail in the relevant draft chapter of the Biodiversity Country Study (Glazewski and Kanguuehi, in prep).

This review draws attention to the consequences of Namibia having become a signatory to the UNCED Biodiversity Convention in 1992. The Convention requires its contracting nations to adhere to certain international norms, objectives and guidelines to assist national decision makers. These guidelines and principles are widely accepted as a sound basis for the development of National Biodiversity Strategies.

In addition to being a signatory to the Biodiversity Convention, Namibia has acknowledged its international responsibilities by acceding to six other international conventions and treaties, all of which incorporate biodiversity protection as a key goal. In summary:

1. Framework Convention on Climate Change (UNCED, 1992)
2. Convention on International Trade in Endangered Species (CITES) (1991)
3. Ramsar Convention on Wetlands of International Importance (1995)
4. Convention to Counteract Desertification
5. Basel Convention on International Management of Hazardous Waste
6. Conventions on the Protection of the Ozone layer

Significant national programmes are already operating in support of Biodiversity, Wetlands, CITES and Desertification.

1.8.2 Institutional structures

There is no such thing as an ideal institutional structure to manage biodiversity issues and sustainable development in any country. The debate to define one would be endless. In reality one works with what one has, most often changing in small incremental steps in response to the circumstances and political priorities of the day. The institutional structures for environmental management in Namibia have some excellent features. The state administration is small and centralised and is busy adapting to a new, more democratic style of operation. From the point of view of biodiversity and the environment, it is a technically talented administration. It has a complex task of responding to change and at the same time guiding it. The considerable financial assistance from aid agencies and NGOs is a measure of confidence in this sector.

The principal state agency is the Ministry of Environment and Tourism (MET) divided into four Directorates:

- DEA - Directorate of Environmental Affairs
- DRM - Directorate of Resource Management (and Research)
- DTR - Directorate of Tourism and Resorts
- DOF - Directorate of Forestry

In respect of other aspects of environmental management, responsibility lies with the other state agencies such as water, agriculture, land, sea fisheries, mining, etc. Typically, each has a fairly sectoral view of their own responsibilities exhibiting resistance to inter-Ministerial interference. In respect of the management of the environment and its biodiversity, almost everything is cross-sectoral and progress can only be achieved through extensive co-operation and communication within and between agencies. There is plenty of evidence of these universal inter-agency weaknesses operating in Namibia. There is also evidence that the Namibian environmental agencies are well structured and tackling the necessary changes with energy and purpose.

MET's four directorates form a useful and logical association. The allocation of a policy development, planning and co-ordination role to a small technically strong team (DEA) is a wise move. This group is responding energetically to change and is in fact driving it. Its productivity in respect of Research Discussion Papers, Draft Policy Documents, Case Studies and Workshop Proceedings is impressive. There is however a risk of them moving ahead without enough attention to implementation capacity. There is evidence of lack of communication with other agencies and possibly lack of understanding of how implementation agencies needs can be addressed. There is a sense that the unavoidably slow response of agencies with a large and dispersed staff structure, possibly carrying an inexperienced

affirmative action contingent, are not being given a fair opportunity to upgrade their capacity and adapt to change both at the same time.

At a technical level however, the DEA, which is the agency involved with most of the NGO funding for biodiversity, operates well multilaterally and in facilitation roles. Much of their work, especially that requiring implementation by other agencies, stops at the conceptual level. Attention deserves to be paid to short-comings in implementation. This may indicate that time needs to be spent on communication, education and training, generally increasing capacity to manage and implement policy.

The size of the technical staff of agencies involved directly with biodiversity is small, and much co-ordination (or lack of it) is handled at a personal level. There is a need to set up more formal links where mutual interest requires it. For example, managers of biological data-bases and reference collections need to be formally linked to their user agencies (their market). At present these are in three separate Ministries - NBRI in Agriculture, National Museums in Education and the main user agencies are in Environment and Tourism. The opportunity provided by compiling the Country Study should be used to cement some of these linkages before personnel changes make the task more difficult.

1.8.3 Policies in support of biodiversity

The Directorate of Environment Affairs has been a prolific producer of policy and advisory documents since 1993. Their in-house publications list of over 90 titles, includes:

- 13 strategic plans and policy documents
- 17 research discussion papers
- 10 workshop or symposium proceedings
- 30 scientific papers

It is understood that MET policies and most DEA policies are intended to apply to the entire Ministry. Policies from the Directorates of Tourism and Resource Management were not obtained for this review. The Directorate of Forestry is in the process of developing a whole new management strategy and is reluctant to present policies for review at this stage (H Kojwang, pers com). A full list of DEA policies on biodiversity is located in the references. Not all of the full list of DEA documents have been reviewed for this report. Several are interim reports in an ongoing process of refining ideas, evolving from discussion papers to plans and policies. As a body of evidence it is impressive, both in its content and in the extent to which participatory processes have been used in the evolution of these documents. Many of the documents on resource economics and community

based conservation are highly regarded among researchers and policy makers in other countries in the region.

The lack of documents from other agencies raises some interesting points. The Directorate of Resource Management, the principal implementation agency for biodiversity conservation, had difficulty producing published material. This was partly because their offices were being re-built with staff in situ - requiring all files and library material to be stored in boxes. More significantly, they knew nothing of the review process and hence were not prepared. The NBRI was in a similar state of dysfunction, in the process of moving into new accommodation. The National Museums and NBRI did not appear to have plans or strategies to achieve targets in support of biodiversity in terms of their approach to completing their taxonomic collections and synthesising or computerising their data. There exists a sense in these agencies that the task is simply so far beyond their present capacity that planning merely produces goals that are trivial or cannot be met. The shortage of time for the reviewing consultants precluded more exhaustive searches and interviews.

The Directorate of Tourism was not targeted in the initial project tasking exercise. Subsequent discovery of a three year old Tourism Development Study that had produced an approved National Tourism Strategy, allowed for only superficial telephonic evaluation. There appears to be a lack of commitment to this document by MET staff consulted, indicating a possible lack of sufficient involvement of other parties in its compilation. As tourism is the principal economic activity supporting biodiversity and sustainable resource use this situation is a little strange. It indicates a lack of sufficient communication between aid agencies as well as Government departments.

1.9 NGO AND PRIVATE SECTOR INVOLVEMENT

1.9.1 Non Government Organisations

NGOs may function in many diverse ways, from lobbying and advocacy, to support of state functions. In the latter case they select activities that the state apparatus does not manage well and yet is attractive to funding agencies, i.e. has the right social or environmental profile. Most of them have a strong social development component to their environmental or biodiversity objectives, such as education or community empowerment. As with NGOs throughout southern Africa, they are mainly indigenous, managed and directed by local citizens. These citizens are predominately from the educated elite sector of society and mainly white. It is quite remarkable for a population of 1.6 million to have such a strong and effective environmental NGO contingent.

The "donor agency" function of NGOs is not discussed in this document. Their financial support increasingly comes from foreign sources, although there is some support from local businesses and fund raising efforts, but the local proportion of total funding is small.

The more significant of the ± 20 environmental NGOs (Tarr, 1996) currently operating in Namibia, are:

- Desert Research Foundation of Namibia (together with Enviroteach) (DRFN)
Managing desert research and Gobabeb Research Station, leading agency in Namibia's Programme to Combat Desertification (NAPCOD), emphasis on education, sustainable community development in arid lands.
- Earthlife Africa (Namibia)
Environmental advocacy, justice and public education, emphasis on urban industrial and community issues, current emphasis on recycling.
- Integrated Rural Development and Nature Conservation (IRDNC)
Managing community based natural resource management projects.
- Namibian Business Forum for the Environment (NBFE)
Forum for business involvement in environmental issues, maintenance of environmental standards in businesses and reduction of environmental impact.
- Namibian Environmental Education Network (NEEN)
Self explanatory
- Namibian Nature Foundation (NNF)
General promotion of nature conservation and financial management
- Save the Rhino Trust (SRT)
Promotion of rhino conservation through education, research, monitoring and community based rhino protection for tourism.
- World Wild Life Fund (Namibia) (WWF)
Primarily for the administration of USAID funding of the LIFE Project with the National CBNRM Programme.

The relationship between these NGOs and the state agencies is generally good. Reference to the useful roles they play, the expertise and flexibility they have and the solid relationships and reputations they have been able to build are frequently referred to in the literature. The standing of DRFN in

particular is of world standard as a research agency. The pioneering work of IRDNC and its community game guard programme has earned wide acclaim. All of the above NGOs adopt the principles of sustainable living and therefore of protecting biodiversity as the core of their philosophy.

1.9.2 Private sector involvement

The most significant stimulus to private sector involvement in supporting biodiversity conservation, has been the 1967 legislation conferring on commercial farmers, ownership rights to certain game species. This gave rise to a thriving trophy hunting and live-game industry which, in more recent years, has expanded vigorously into the non-consumptive or photographic wildlife tourism industry. These developments have resulted in commercial land use converting from livestock production to multi-species production (livestock and wildlife) and to pure wildlife management and tourism. Apart from the increase and spread of large mammal (game) species that have direct financial value, biodiversity is enhanced by halting the negative impacts of livestock raising. This refers to overgrazing and bush encroachment, the two main land degradation processes that result from poor livestock management.

The negative impacts on biodiversity, typical of privately owned land, are evident as bush encroachment and overgrazing (Bester, 1996). It is assumed that the long-term effects of these changes will include loss of species and ecosystem resilience i. e. the systems restorative ability. The short-term loss of biomass and species is obvious, but this is also the normal response of a dynamic, arid ecosystem to normal climate variations. The degree of permanence of these changes has not been demonstrated, although they are permanent enough to make conventional stock raising sub-economic. It is legitimate to assume that types of land use that counter these negative processes are beneficial to biodiversity and help maintain ecosystem functions. It should be noted however, that overstocking of wildlife on commercial farms does occur and can contribute to desertification in the same way as poor livestock management. The overall impact of the private sector through agriculture is reflected in the rangeland and pastoralism topical report.

All aspects of physical development and business activity have the potential to affect biodiversity. The mitigation of these impacts is catered for by way of Namibia's Environmental Assessment Policy (DEA, 1995) which provides for the adoption of formal environmental assessment procedures (IEM) and the establishment of an Environmental Commissioner reporting to an Environmental Board. The policy is most appropriate, it remains to be seen whether its implementation and policing are adequate. The other main avenue through which the private sector and local businesses can involve themselves in biodiversity issues is through the NGOs. In this regard, the

main emphasis of NBE is the promotion of high environmental standards in industry and commerce. They support the use of progressive management tools such as EIAs and environmental auditing.

2. TRENDS AND THREATS

2.1 MONITORING AND THE ESTABLISHMENT OF TRENDS

A driving force in shaping Namibia's biological diversity is the variability of its climate, in particular its rainfall. A consequence is that the short-term presence or absence of species, or even communities of plants and animals, tends to follow the weather. In healthy, non-degraded habitats, plants and vegetation come and go and animals physically move over vast distances in order to adapt to their dynamic environments. In degraded ecosystems episodic events combine with human related influences, usually to exacerbate negative environmental trends. In terms of monitoring, this level of natural fluctuation creates noise, or background variation in the data, that obscures trends and masks specific responses to management (or mismanagement).

The coincidence of overgrazing and a protracted dry period of several years, can cause the entire grass and herb layer to fail - several times. Recovery time in a healthy ecosystem can be as short as a single season. Degraded systems appear to change irreversibly. Either they remain under the suppressive influence of livestock and people or, if released from that influence, have not been rested (and monitored) for long enough to recover their ecological functions or their biodiversity. The question is, is this condition irreversible or does it simply need more time? The answer may be irrelevant, by then the site will be economically bankrupt.

The unpredictable and variable climate makes the linking of causes to effects very difficult. Determining cause and effect is also complicated by there being a relatively short and sparse climatic record, and often only circumstantial records of environmental response. Environmental records have improved somewhat in the last 30 years since the establishment of research stations such as Gobabeb (Seely and Ward 1988) and the one in Etosha National Park. Apart from consolidated weather records, no synthesis of long-term data is available for terrestrial environments. A tentative conclusion can be drawn that there is no evidence of any cyclic or predictable pattern in Namibia's weather conditions.

2.2 TRENDS

The purpose of monitoring biological diversity is to establish trends, identify causes and predict future change. Management actions are then aimed at enhancing biodiversity by countering or avoiding the anticipated change. Knowledge of environmental trends is vital, it allows people to prepare for them or avoid them and helps to allow for a more sustainable way of life. Namibia's variable climate and the shortage of long-term data makes prediction of change

and trends very risky, often impossible. Developing environmental plans and policies without predictive information is essentially a gamble.

A well designed monitoring programme selects indicators that are expected to change in response to specific management actions, and compares them with others that function as controls. The larger national parks and protected areas, particularly if they are not fenced, should be managed partly to perform this control plot function. In monitoring free-ranging wild species and their habitats, it is assumed that they function as indicators whose response to their environmental pressures, will indicate trends if recorded over a long enough time. If the indicators are selected wisely a manager should be able to distinguish between change that has human origins and change that is driven by climatic influence. Although it is no longer possible to eliminate human related influence from any monitoring site, protected wilderness areas and national parks come as close as possible to that ideal. It is important that the monitoring and management plans for these protected areas, design this witness stand function into the regular responsibilities of park staff

2.2.1 Tools for monitoring

There are standard tools for monitoring changes in biodiversity, such as:- Red Data Books, Biological Atlases, periodic surveys and censuses and conservation status reports. In Namibia these tools are either already in use or are planned. The compilation of suitable inventories for protected areas and the incorporation of routine monitoring of key elements into the national database, is also an important part of any national programme. Patterns of biodiversity also exist at the landscape or ecosystem scale and it is these that must be identified and monitored, probably by combining remote sensing with ground truthing at selected indicator sites - e.g. wetlands, protected areas, estuaries. In keeping with the lack of an ecosystem-scale perspective on biodiversity (see # 1.7), there is also a lack of any priority to monitor biodiversity at this scale. A multi-disciplinary co-operative approach to the overall task is essential, probably requiring a national level workshop to bring together the expertise and information necessary.

Conventional means of measuring changes in biodiversity are focussed on species. The Red Data Book lists of rare and threatened species, as developed by IUCN, are in the forefront. Lists specific to Namibia are only now being drafted for the first time, so their value as monitoring tools will not be realised until comparisons over time can be made. Red Data Books for birds, mammals, reptiles and amphibians are expected this year from MET biologists. Those for plants and certain categories of insects are planned (Barnard, in prep). The South African Red Data Book series developed between 1984 and 1989 has one edition on fish which encompasses Namibia (Skelton, 1987). These Red Data Books will form an important part of the biodiversity baseline inventory which is the function

of the UNEP Country Study. This will also be the first building block of a National Biodiversity Monitoring Programme.

An important and sophisticated environmental monitoring activity that Namibian biologists and naturalists have been involved with for several years is the Southern African Bird Atlas Project. This ambitious, multinational undertaking has spread and grown throughout the sub-continent. It is the largest and most sophisticated biodiversity mapping project ever undertaken in Africa and its database is already being examined for its ability to provide numerical as well as distribution monitoring data (Robertson et al 1995). The potential for mobile bird populations to provide diverse indices of habitat change has long been recognised. With Namibia's arid and variable environment and the availability of a large computerised data base there is an ideal opportunity to explore the potential of bird atlassing to provide an efficient monitoring tool.

Namibia joined the Ramsar Convention in 1995 and has listed six coastal and six inland wetlands that it considers to be of international importance (Hines and Kolberg, 1996). It is intended to compile proposals for these sites to get them registered in terms of the Convention. Many of these wetlands, particularly the coastal ones, are regularly monitored for water-bird numbers, as contributions to national and regional research programmes. Migratory bird numbers on wetlands are seen as potential environmental indicators, but their population dynamics are also strongly influenced by environmental impacts at other, often remote, habitat sites.

Routine plant, animal and climate monitoring, as well as regional aerial censuses, are an integral part of Protected Area Management Plans (MET, 1993 and Rodwell et al, 1995). For management plans and park management to be effective, they must be linked strongly to monitoring. In Namibia's protected areas these functions are carried out mainly by staff of two closely allied directorates of MET, namely DEA and DRM. Background environmental data is contributed by other agencies such as the Department of Meteorological Services. It is a great advantage if responsibility for these activities resides within a single organisation. Where this is not possible the linkage between monitoring and management must allow for strong inter-agency connections. This is necessary to ensure that the needs of managers are taken into account in deciding what data are collected and how they are analysed and presented. Seely (1991) presents a good example in showing how much more meaningful it is to use the median as the annual measure of rainfall, rather than the mean or average. With the advent of global climate change, there is a need to review the climate monitoring task of the meteorological authorities and adapt them to meet the needs of resource managers.

The lack of any country-wide environmental monitoring programme indicates that the task of setting one up needs to be studied and initiated. It could be built in as a bi-product of the Regional Profiles that are planned by DEA. The intention to initiate a State of the Environment Report indicates that such thinking is already in progress (Brown, 1994). A comprehensive monitoring programme is a major undertaking involving climatic, hydrological, marine, palaeontological and biological data as well as all the historical, economic, and agricultural information that would relate indirectly to environmental variables.

2.2.2 Invasive alien species

A potential negative trend in biodiversity is the invasion of relatively unaltered landscapes by species alien to the region. A preliminary assessment was made several years ago (Brown et al, 1984) indicating the country to be relatively free of serious invader species. The most vulnerable systems are the Caprivi wetlands for floating aquatics, where biocontrol programmes against *Salvinia* have been fairly successful in the late 1980s. The ephemeral river lines crossing the Namib are also vulnerable to invasive weeds, but the climatic extremes have prevented extensive spread.

2.3 THREATS

There is really only one trend and threat to biodiversity in Namibia. It is encompassed by the general term - desertification. The NAPCOD workshop (Dewdney, in prep) coined a broad definition,

"land (and ecosystem) degradation resulting mainly from negative human impacts"*

*authors inclusion

The term has so many ramifications that it encompasses all relevant trends and threats. Because Namibia is an arid land with low biological productivity, this broad simple definition also fits well for the purpose of public participation and understanding. It does oversimplify the issue, making it necessary to expand on it so that it can be analysed and appropriate remedies identified.

It is a subjective definition. Its reliance on the negative connotation of degradation reflects a human rather than an ecological perspective. Identification of degradation, assumes the ability to distinguish between human causes of change and climatic or random causes. In reality it is very difficult to separate these causes and therefore it is necessary to accept that desertification is interlinked with climatic variability and probably enhanced by global climate change. The principal measure of this syndrome is that of reduced and more erratic rainfall than hitherto recorded.

Desertification in Namibia is manifested by:

Localised reduction of plant biomass, plant productivity and plant diversity by means of livestock and human use.

The specific processes involved are:

A. OVERGRAZING BY LIVESTOCK (linked to provision of water)

- Long-term, continuous grazing by cattle and small stock causing decline in vigour of the grass sward, loss of productivity, reduction of species diversity (plant and animal)
- Loss of large game populations due to hunting, fencing, disease prevention and grazing competition from livestock (the trend is now being reversed due to the increase in wildlife tourism).
- Widespread reduction of small predators and raptors often by use of persistent poisons (practice now much reduced). [Widespread persecution of problem animals produced some surprising victim species. In several commercial farming areas some years ago aardvarks were vigorously hunted down for their habit of digging under fences, thus allowing predators to gain access!].
- Imposition of a large and increasingly sedentary livestock biomass wherever water is available, which has contributed to a variety of environmental changes from loss of herbage biomass to soil erosion.

B. BUSH ENCROACHMENT (linked to commercial cattle farming)

- Cattle fencing throughout the commercial farming area, later also required by law for game farms, restricts livestock and game movement in response to food and water availability. This has contributed to overgrazing, reduction of fires, lack of browsing and bush encroachment.

C. DEFORESTATION (linked to human use - close to water)

- Throughout the unfenced communal land areas, densely populated subsistence agriculture settlements have been created, especially near the wetlands and rivers in the north. These settlements have caused excessive use of all rangeland resources - wildlife, water, grazing, forest products, soil impoverishment, erosion - giving rise to poverty. (Although there is intensive localised deforestation through the cutting of poles, the use of the term to describe a more comprehensive phenomenon can be misleading. It refers to the removal of only the most visible and long-lived component of the ecosystem - full-grown trees. It conceals by omission, all the other lost components that invariably precede the loss of trees.)

- Poverty is exacerbated by rapid population growth, sedentary lifestyles, lack of ownership rights, lack of alternative resources for fuel, construction material and even valued indigenous food plants (Hyphaenae palms are sometimes killed by destructive harvesting)

D. UNSUSTAINABLE USE OF WATER FOR ALL PURPOSES

- Almost all sources of freshwater, both surface and groundwater, are used to the point of depletion in most areas. This excludes localised water extraction from the large border rivers.
- Widespread impoundment of streams and rivers by industrial and farm dams, increases evaporative water loss and water use, and sharply reduces stream flow and aquifer recharge downstream.

E. SALINISATION OF (CULTIVATED) LAND

- A combination of high evaporation rates, poor water quality, and soils that are either highly mineralised (potentially saline) or very low in minerals (i.e. Kalahari sands that require unsustainable levels of fertilisation in order to grow crops) makes the risk of salinisation of irrigated land very high. The effect of salinisation is highly damaging. It ultimately destroys all biological activity and severely extends the restoration of ecological processes and biodiversity. However, the overall impact is low because the area involved is small and indigenous vegetation would have already been removed (area statistics not examined).

2.4 POSITIVE TRENDS FOR BIODIVERSITY

While this report deals with negative trends and threats, it is useful to note existing positive trends that appear to be beneficial for biodiversity as well as the economy. There may be lessons they contain for future reference. One observation is that there are only very crude quantitative measures of the rate or the extent of these trends. Where there is a measure it is to be found in economic and administrative statistics. The assumed benefits to biodiversity are purely intuitive. The possibility that all five of the established conservancies on commercial land are overstocked with game and degraded (M Lindeque, pers com) indicates that better quantitative measures of trends such as these are urgently needed.

The trends assumed to be beneficial are:

- i) Increasing conversion of land-use from conventional livestock production to multi-species production and pure wildlife and tourism based production systems.

- ii) Increasing recognition by the state of the value of protected areas and tourism, evident from the proclamation of parks (desert and wetland) and other conservation measures. This in the face of several negative political indicators, viz: land hunger and the call for redistribution, conservation's apartheid past with no local benefits or involvement, the low political value (votes) of conservation.
- iii) Increasing success and acceptance of CBNRM as a process delivering sustainable community development.
- iv) Significant increases in charismatic or flagship species such as desert elephants and rhinos.

3. IMPLICATIONS FOR USAID

As USAID commissioned this report it is considered reasonable and useful to summarise the trends and threats and set them out against the goals of USAID's Namibia programme.

The overall trend and threat to biodiversity is desertification, which encompasses *"land and ecosystem degradation resulting mainly from negative human impacts"*

This is characterised by,

- **Threat** → overstocking of livestock with loss of competing herbivores, grass and all productive vegetation.
Trend desertified patches, centred on available water, increase in extent and intensity; additional water-points cause degraded patches to merge leaving no grazing reserve; vegetation loss causes bare ground with soil erosion by wind and water; reduction of soil-stored seed reserves and other soil organisms; restoration rate will depend on: duration (intensity) of human/livestock impact; ongoing use; and climatic variables.
Decline in large mammal populations halted, now reversed in some commercial farming areas;
- **Threat** → bush encroachment with loss of livestock productivity
Trend increasing replacement of grass with thorn scrub which becomes self-limiting for ongoing livestock use; trend stabilises at set shrub density; economic decline favours wildlife management which, if selected, may eventually reverse the trend; extreme dry spells and unknown causes can cause large-scale die-off of shrub species (trend unknown);
- **Threat** → deforestation and general vegetation loss to point of soil erosion
Trend people and livestock are tied to water-points, so deforestation is simply an advanced phase of the overstocking - desertification trend; depending on human response to desertification, trend will proceed to and stabilise at, a patchwork of wasteland/grassland (Oshanas) or wasteland/scrub (Kalahari);
- **Threat** → unsustainable use of water from boreholes and through proliferation of impoundments
Trend lowering of water tables and increasing salinity of ground-water; self-limiting when undrinkable, recovery characteristics unknown; riverine aquifers markedly reduced, water unavailable to digging animals (+man) vegetation loss along linear oasis;
- **Threat** → salinisation of cultivated land
Trend usually short and terminal; salinisation of the root zone can also occur on uncultivated land where complex hydrogeology enables saline and

fresh-water aquifers to mix. (The removal of a substantial tree component in similar biogeographic circumstances in West Australia, caused massive salinisation. {ref. not available});

USAID's three country-level goals:

- to safeguard the environmental underpinnings of broad based economic growth
- to protect the integrity of critical ecosystems
- to ameliorate and prevent environmental threats to public health

Analysing the consequences of these trends, strongly suggests an approach that combines policy level responses, paired with rigorous "field testing". The consequences of all major threats and trends involves policy deficiencies and the need for social and institutional change at grass roots level. In selecting assistance programmes it will be necessary to design them with matching policy development and implementation components, which must be fully integrated and mutually supportive. A prerequisite in policy development is an appropriate depth of public participation, which is virtually guaranteed if there is a focus on implementation. Policy is often developed with participation only of policy-level thinkers, who are usually not those who have to live in the affected area.

It is interesting to note that a working-group analysis of desertification issues at the NAPCOD workshop, developed a list of priorities very similar to those arrived at independently through this report. However, the coincidence of conclusions should be expected as we used substantially similar sources of information.

The NAPCOD workshop recommendations for policy reform:

- Land management and resettlement reform, including tenure
- Water pricing
- Redesigning drought aid livestock subsidy
- Natural Resource Accounts integrated into economic planning
- Amending Population Policy
- Investment incentives for services

The NAPCOD recommendations are formed specifically, . . . *"to inform decision makers of the impact of policy instruments on desertification and make recommendations for reform"*. On the strength of the attendance list, these workshop proceedings are authoritative, and the analysis, conducted through a structured participatory process, is comprehensive and logical. The NAPCOD workshop proceedings, when published, will provide a more thorough analysis of the issues than is possible in this short review. If they are used in conjunction with the upcoming Biodiversity Country Study, together they will provide an excellent basis for more precise planning of assistance programmes.

3.1 CONSEQUENCES FOR ECONOMIC SECURITY

Further losses of biodiversity will surely be mirrored by a declining rural economy. This is most advanced in the north where the potential for CBNRM alternatives are most promising. The future development of these regions will tend towards increasing contrast between overused settled areas based on pumped water supplies, compared to the proclaimed reserves and dryland CBNRM conservancies. Unless improved tenure and sustainable agro-urbanisation solutions can be found for these settlements, then their social and economic plight will overwhelm the ability of the protected areas to make up the deficit in jobs and revenue.

3.2 CONSEQUENCES FOR ECOSYSTEM FUNCTION

The regions that are already significantly degraded may have slipped below an ecological threshold, above which it is too expensive to restore them. The bush encroached areas still function ecologically, they simply have a different species composition and are less productive economically. Conventional approaches to try and resurrect these areas back into economic productivity are costing much more than the total cost of the land, let alone the cost of its productivity. This has been clearly demonstrated in the case of bush encroachment. Ecologically, bush encroachment may be seen as a defensive or healing mechanism, a negative feedback control mechanism, like the heavily browsed thorn bush that responds by producing more thorns and less leaves. The threat from bush encroachment is economic, not ecological.

The same may not be the case in the severely overgrazed and deforested areas. The possibility of restoration has not been demonstrated in the severely overgrazed and deforested areas of the Oshanas for instance. One of the problems with needing to do such an experimental manipulation is that there are people involved who have no rights of tenure. The state who owns the land would not be able to justify removing hundreds of people to run an experiment on their vacated land, to see how long it takes to recover. The people-pressure on these areas can only be relieved by developing more sustainable and non-agrarian life support systems.

3.3 CONSEQUENCES FOR PUBLIC HEALTH

Rural people in the heavily populated areas of northern Namibia suffer a variety of debilitating and fatal diseases. The most common are, malaria, measles, acute respiratory infections, sexually transmitted diseases, AIDS, plague, malnutrition and tuberculosis (Marsh and Seely, 1992). Where open water is present malaria is the most serious problem, probably unaffected by loss of biodiversity from the over-exploited water bodies in which the larvae breed. Bubonic plague is endemic to northern Namibia and is environmentally linked via the rodent host population, which periodically irrupts, makes increasing contact with humans and becomes a

major (temporary) food item. Rodent irruptions appear to be controlled by rain and food abundance, and rodent/human contacts are increased by food shortage factors.

The only other connections that link environmental threats to public health with biodiversity are the general linkages between landscape degradation and poverty.

This is a rather remote linkage containing little further opportunity for intervention from a biodiversity point of view.

4. CAUSES OF ENVIRONMENTAL PROBLEMS

The root causes of Namibia's environmental problems are all tied up with desertification. In order to manage these problems, it will be necessary to focus simultaneously on their direct and indirect causes, i.e. the symptoms as well as the root causes. The linkages between the two are often remote and complex, requiring wide experience and specialised analytical skills to identify and quantify them. Additional skills are also needed to convert these technical analyses into politically persuasive prose sufficient to convert into policy.

In listing direct and indirect causes there is often no clear distinction between the two, or between cause and effect. Bush encroachment for instance, is a cause of economic decline in terms of animal production and ecological decline in terms of biodiversity, but it is also a symptom of both. Impoundments are both a cause of water table loss and a consequence of rising water demand. The lists below are offered as an individual view of these sometimes complex relationships.

4.1 DIRECT CAUSES

The direct causes of desertification in Namibia are an inseparable mix of climatic and human induced pressures on renewable resources. They result primarily from increasing rates of consumption of rangeland vegetation by livestock and people, against a background of climatic variability enhanced by global climate change. An urgent and socio-economic focus is provided in communal land where extreme degradation entrenches disempowerment, poverty and ill health. While these impacts remain in place the losses of biodiversity are massive and likely to become increasingly irreversible. This is evident by way of the loss of ecosystem functions such as: maintaining soil fertility, recharging water tables, and migration in response to food availability (Seely, 1991).

Specific direct causes include:

- Overuse of plant resources by livestock; this is due to the patchy and sedentary pattern of livestock management made possible in areas unsuited to continuous grazing by the widespread use of groundwater. A further cause of overgrazing is ignorance of the nature of arid ecosystems that have low primary production, due to lack of adequate soil moisture and nutrients, in turn a result of climatic and edaphic (site) factors
- Human population growth; causing direct increases in demand for food and fibre beyond the productive capacity of the land, leading to deforestation and the whole desertification syndrome
- Lack of choices or alternatives to subsistence lifestyles; due to poverty, lack of education and lack of alternative resources for economic development

- Construction of private and state-owned impoundments; caused by the need to meet essential water demand; but causing the lowering of riverine water tables, loss of vital riverine vegetation (the linear oasis) and expensive loss of water through high rates of evaporation from dam surfaces

4.2 INDIRECT CAUSES

The links between desertification, loss of rangeland productivity and loss of biodiversity, unquestionably demonstrate that threats to biodiversity are threats to the resource base for economic growth. Glazewski and Kanguuehi (1996) list the globally recognised root causes of biodiversity loss, all of which apply to Namibia, viz:

- population growth and increasing resource consumption,
- ignorance about the roles of species and ecosystems,
- poorly conceived policies,
- effects of global trading systems,
- unequal resource distribution,
- failure to account fully for the value of biodiversity.

This leads to our own independent list of root or fundamental causes of environmental problems in Namibia:

- Increasing demand from an expanding human population
Politically correct arguments about the potential of land redistribution, the use of more appropriate technology and improved rights of access must not be allowed to distract from the inevitability of overpopulation - the clash between uncontrolled demand and finite supply. This is not intended to devalue these secondary, more short-term approaches, merely to prioritise the dominant one.
- Unequal access to land and the means of livelihood
This amounts to policy failure in communal land tenure. To accommodate fixed settlements and population growth in a finite environment, solutions will not be found in the realms of central control and state ownership. The conservancy concept is designed to address the problem where wildlife and nature based tourism have the potential to dominate the local economy. In situations where livestock management practices are important, similar "communal ownership" of rangeland resources and water points should be developed.
- State subsidies for water and livestock maintenance (drought aid)
This is another case of policy failure where policy has not accommodated the predictable variability of livestock forage supply (predictable that it will be highly variable, but not by how much or when). The failure extends to

the need to restructure the economy to reallocate the real cost of water and thereby stimulate an appropriate water conservation habit among users.

- Lack of ecological understanding and translation into rural policy and practice

Ecological interpretation of the environmental constraints to land-use are fuzzy and unquantified. Ecologists doomsday scenarios have not been believed nor have they been welcome, the language of scientists has not been understood by politicians.

5. DEFICIENCIES IN KNOWLEDGE AND PARTICIPATION

5.1 BIODIVERSITY INFORMATION

- There is a need to make current knowledge on species and biogeography more complete, more capable of analysis, and more available to the public. The relatively good state of knowledge in Namibia means that practical goals for a useful level of completeness is achievable. Such a level should be determined primarily by resource managers and planners rather than taxonomists. The Biodiversity Country Study should provide a comprehensive basis for describing achievable objectives for such a programme.
- There is a need to develop a Biodiversity Conservation Strategy, emphasising the protection and monitoring of biodiversity elements not included in the present protected area network. The strategy should define information needs to be met by the Biodiversity Task Group based on current knowledge (broad-brush maps, analysis of trends and threats, identification of key processes). The strategy must search for innovative approaches to conservation, probably in the area of economic motivation and local responsibility and empowerment.

5.2 RESEARCH, MONITORING AND MANAGEMENT

These three operational fields are deliberately placed together to emphasise the point that they must be firmly and closely linked to function effectively.

- There is a need to develop a broad environmental monitoring strategy in which the role of protected areas as well as species level elements of biodiversity are an integral part. The existing indications are that monitoring is likely to be limited to species and population level activities. It should broaden to the monitoring of patterns of biodiversity at the habitat or ecosystem level. Comparative monitoring along land-use transects or gradients of use, in the style of the Biosphere Reserve model, would be appropriate.
- There is a need for research to identify biological or other indicators of environmental trends. Birds may present the most productive area in which to identify indicator species. Indices developed for soil biota or organic matter content may also prove useful in the understanding of ecological thresholds and ecosystem resilience. Soil biota includes seed stores and other features or processes involved in ecosystem recovery.

- There is a need for continuous attention to upgrading skills and experience of protected-area managers. Affirmative action in this area needs to focus on potential middle and top order park managers because they will be the first to inherit leadership roles once the present incumbents move on. There are increasing choices for this sort of practical training in the SADC region which generally are more practical and relevant than equivalent overseas courses. University training for potential specialists/researchers is also necessary in biodiversity and community development fields.

5.3 STAKEHOLDER PARTICIPATION

A fundamental principle applicable to community development is that the growth and sustainability of development is dependant on institutional capacity above all else. It is obvious therefore that empowerment issues will dominate when it comes to community needs.

- There is a need to improve peoples capacity to participate in decision making in resource management and community development. It is nothing short of a remote-areas adult education task and as such it is beyond the mandate and the capacity of the resource management agencies in MET. There are two areas of training that are within the MET mandate.
- Training in PRA (Participatory Rural Appraisal) and facilitation skills for technical/sociological staff of MET, including in information gathering and analysis.
- Training for community leaders in development skills, management, decision-making, politics, leadership, life skills and natural resource management. This activity would be limited to those communities involved in CBNRM activities. The wider educational needs of rural communities must be addressed through normal educational channels.

6. FUTURE DEVELOPMENT PRIORITY OPTION

- i) Complete, analyse and codify taxonomic collections and databases
- ii) Feasibility study for national monitoring programme for resource management, land-use and biodiversity
- iii) Research project to identify practical quantitative indicators of major environmental trends
- iv) Develop a database of indigenous/traditional biodiversity and resource use knowledge
- v) Conduct propagation and genetic improvement studies on indigenous food plants
- vi) Develop multi-agency approach to production of land-use planning tools (i.e. agro-ecological map)
- vii) Major land tenure participatory research project working with other Ministries
- viii) A range of training and bursary programmes with emphasis on practical experience
 - In-service training co-ordinator
 - PRA, facilitation, community development trainers
 - Community technical trainers
 - Travelling park warden exchange programme within the region

7. REFERENCES

- ASHLEY, C. 1995. Tourism, communities and the potential impacts on local incomes and conservation. DEA Research Discussion Paper 10:43pp + appendices.
- ASHLEY, C. 1996. Balancing population pressure and environmental sustainability. *Namibia Environment* 1: 178-184.
- BAKER, L. 1996. Namibia's Game Parks and Recreation Areas. *Namibia Environment*, 1:32-49.
- BARNARD, P (ed). In prep. Biological diversity in Namibia: a country study. Namibian National Biodiversity Task Force/Ministry of Environment and Tourism.
- BARNARD, P; GRIFFIN, M; BROWN, CJ & SIMMONS, R. 1994. Biological diversity in Namibia: issues and priority needs for the implementation of a future national biodiversity strategy. DEA Discussion Paper. 7pp.
- BARNES, JI & DE JAGER, JLV. 1995. Economic and financial incentives for wildlife use on private land in Namibia and the implications for policy. DEA Research Discussion Paper 8: 21pp.
- BARNES, JI. 1995 a. Current and potential use values for natural resources in some Namibian communal areas: a planning tool. DEA Draft Discussion Paper, 60pp.
- BARNES, JI. 1995 b. The value of non-agricultural land use in some Namibian communal areas: a data base for planning. DEA Research Discussion Paper 6: 21pp.
- BARNES, JI. 1996. Trophy hunting in Namibia. *Namibia Environment* 1:100-103.
- BETHUNE, in TARR, PW. 1996 C. *Namibia Environment Vol 1*. DEA/MET Windhoek
- BROWN, CJ, MACDONALD, IAW and BROWN, SE. 1985. Invasive alien organisms of SWA/Namibia, SANSP Report no. 119 , 74pp CSIR Pretoria.
- BROWN, CJ. 1994. Namibia's 12-point plan for integrated and sustainable environmental management. Directorate of Environmental Affairs, 9pp ms.
- BROWN, CJ. 1996. The outlook for the future. *Namibia Environment* 1:15-19.

- BURKE, A. 1996. Vegetation in Namibia. draft ms for biodiversity country report 3pp.
- CORBETT, A & GLAZEWSKI, J. 1996. Environmental law in Namibia. *Namibia Environment* 1:25-29.
- DEA. 1994 a. Conservation of biotic diversity and habitat protection. MET. 3pp.
- DEA. 1995 a. Namibia's Environmental Assessment Policy for sustainable development and environmental conservation. Ministry of Environment and Tourism. 17pp.
- DEA. 1994 b. Land-use planning: towards sustainable development. MET. 18pp.
- DEA. 1995 b. Namibia policy on wildlife management, utilisation and tourism in communal areas. MET 23pp
- DEA. 1995 c. Promoting community-based tourism. Ministry of Environment and Tourism. 7pp.
- DEA. 1994 c. Mission statement and the mandate of the Ministry of Environment and Tourism. MET 3pp
- DEA. 1994 d. Namibia's national policy to combat desertification. MET. 4pp.
- DEA/DRFN (eds). 1994. Proceedings of Namibia's National Workshop to Combat Desertification. Desert Research Foundation of Namibia. Windhoek. 214pp.
- DEWDNEY, R. (In prep). Draft final report to the NAPCOD Policy & Planning Working Group. pp1-60.
- ERB, K.P. 1996. Rhinoceros Conservation in Namibia. *Namibia Environment* 1:153-156.
- GIESS, W. 1971. A preliminary vegetation Map of SWA. *Dinteria* 4:5-114.
- GLAZEWSKI, JI & KANGUEEHI, N. (In prep). Legal approaches to protecting biodiversity in Namibia. In: BARNARD, P (ed). *Biological diversity in Namibia: a country study*. MET/DEA.
- GRIFFIN, M & BARNARD, P. 1996. What is this thing called biodiversity? *Namibia Environment* 1:122-125.
- GRIFFIN, M. 1993. Biological diversity in Southern Africa, the path ahead. Namibia country report. ms MET/DRM.

GRIFFIN, M. 1994. Checklist and provisional conservation status of amphibians, reptiles and mammals which are known or expected to occur in Namibia. ms, MET/DRM.

HOFF & OVERGAARD. 1993. Namibia Tourism Development Study. Ministry of Wildlife, Conservation and Tourism. Commission of European Communities Windhoek.

HOLM-PETERSEN, in TARR, PW. 1996 C. Namibia Environment Vol 1. DEA/MET Windhoek

JACOBSON, PJ, JACOBSON, KM and SEELY, MK, (1995). Ephemeral Rivers and their Catchments: Sustaining people and their catchments in Western Namibia. DRFN. Windhoek.

JONES, BTB. 1993. People, parks and biodiversity: challenges for Namibia. Paper presented at the workshop Science as a facilitator for maximising the preservation of biological diversity in national parks and other nature reserves. Desert Ecological Research Unit of Namibia, Gobabeb.

JONES, BTB. 1994. Community-based natural resource management. In: DEA/DRFN (eds). Proceedings of Namibia's National Workshop to Combat Desertification. DRFN, Windhoek. pp82-88.

JONES, BTB. 1995. Wildlife management, utilisation and tourism in communal areas: benefits to communities and improved resource management. DEA Research Discussion Paper 5: 19pp.

LINDIQUE, M. 1996. Conservation & management of elephants in Namibia. Namibia Environment Vol 1: 145-150.

MACDONALD, IAW & CRAWFORD, RJM. (eds). 1988. Long-term data series relating to southern Africa's renewable natural resources. SANSP report No. 157. FRD/CSIR, Pretoria.

MAGGS, GL; KOLBERG, HH & HINES, CJH. 1994. Botanical diversity in Namibia - an overview. Strelitzia. 1-93-104.

MARSH, A. (undated) Namibia: Environmental degradation and the future. SIDA. Windhoek 20pp.

MARSH, A. 1996. The most important functions of the forestry sector in the Namibian economy. DOF strategic planning workshop. Windhoek. 25pp.

MARSH, A; & SEELY, M. 1992. Oshanas. Sustaining people, environment and development in Central Owambo, Namibia. DRFN 52pp.

MUPETAMI, L, and LE ROUX, L. 1996. An overview of Environmental Education in Namibia. *Namibia Environment* , Vol 1: 131-132.

MET. 1993. Policy guideline document for park management plans. 17pp. *Namibia's GREEN PLAN*. Brown, CJ (ed). (Undated). Ministry of Environment and Tourism, 174pp.

OWEN-SMITH, G. (1996). The Kaokoveld. In *Namibia Environment* Vol 1:62-65.

QUAN, J; BARTON, D & CONROY, C. (ASHLEY, C ed). 1994. A preliminary assessment of the economic impact of desertification in Namibia. *DEA Research Discussion Paper 3*: 150pp.

ROBERTSON, A; SIMMONS, RE; JARVIS, AM & BROWN, CJ. 1995. Can bird atlas data be used to estimate population size? A case study using Namibian endemics. *Biological Conservation* 71:87-95.

RODWELL, TC; TAGG, J & GROBLER, M. 1995. Wildlife resources in the Caprivi, Namibia: the results of an aerial census in 1994 and comparisons with past surveys. *DEA Research Discussion Paper 9*: 29pp.

SCHOEMAN, A. 1966. Conservation in Namibia. *Laying the Foundation*. *Namibia Environment*, 1:6-13.

SCHUMANN, C. 1996. Forestry sector strategic plan. *DOF strategic planning workshop*. Windhoek. 27pp.

SCOONES, I. 1993. Living with Uncertainty. *New Directions for Pastoral Development in Africa*. Overview paper of the workshop on *New Directions in African Range Management and Policy*, Woburn. UK. 44pp.

SEELY, MK. 1991. Namibia. Drought and desertification. *DERU*. Gamsberg McMillan, Windhoek. 20pp.

SEELY, MK & WARD, JD. 1988. The Namib Desert in: Macdonald & Crawford (eds). Long-term data series relating to southern Africa's renewable natural resources. *SANSP report No. 157*, CSIR, Pretoria.

SIYAMBANGO, B 1996. Apparent consumption of wood in Namibia. *DOF Strategy workshop ms*. 16pp

SKELTON, PH. 1987. *South African Red Data Book Fishes*. *SANSP Report No. 137*. CSIR, Pretoria.

TARR, PW. 1996 a. Environmental NGOs in Namibia. *Namibia Environment* 1:207-208.

TARR, PW. 1996 b. International treaties. Namibia Environment 1:159-163.

TARR, PW. 1996 C. Namibia Environment Vol 1. DEA/MET Windhoek.

WOLTERS, S. 1994. Proceedings of Namibia's National Workshop to combat desertification. Report from a National Workshop Windhoek. Namibia. Pp119-122, 161-164.