Conservation of degraded land through terracing and other types of structures

3.1.2 Terrestrial Biodiversity at the Species Level

As with terrestrial ecosystem diversity, knowledge of the status of individual terrestrial species is incomplete and in need of improvement before it can be used for realistic biodiversity planning. Although national lists have been compiled, these are mostly historical and recent records are few and insufficient to provide clear data on present-day distributions of species. A brief summary of these data is provided below. [Note: For animals below the vertebrate level, data are almost non-existent].

Mammals: A total of 126 mammal species have been listed in a recent compilation of existing information. This total includes 9 marine mammal species known to occur in Eritrean territorial waters, but excludes 9 domesticated mammals (sheep, goat, cow, pig, horse, donkey, camel, plus cat and dog). The population status of most of these wild species is poorly known at present, but has been ranked in 6 categories (Critical [Extinct], Critical, Endangered, Rare, Common, or of Unknown Status). This rapid assessment was undertaken by the staff of the Forestry and Wildlife Division (FWD) of the Ministry of Agriculture (MOA), with the aim of identifying needs for improving knowledge of terrestrial wildlife. The status categories simply reflect observation status and do not reflect any direct assessment of threat. The summary results are given below.

Table 2. Assessment of population status of Eritrean mammals (April 1999)

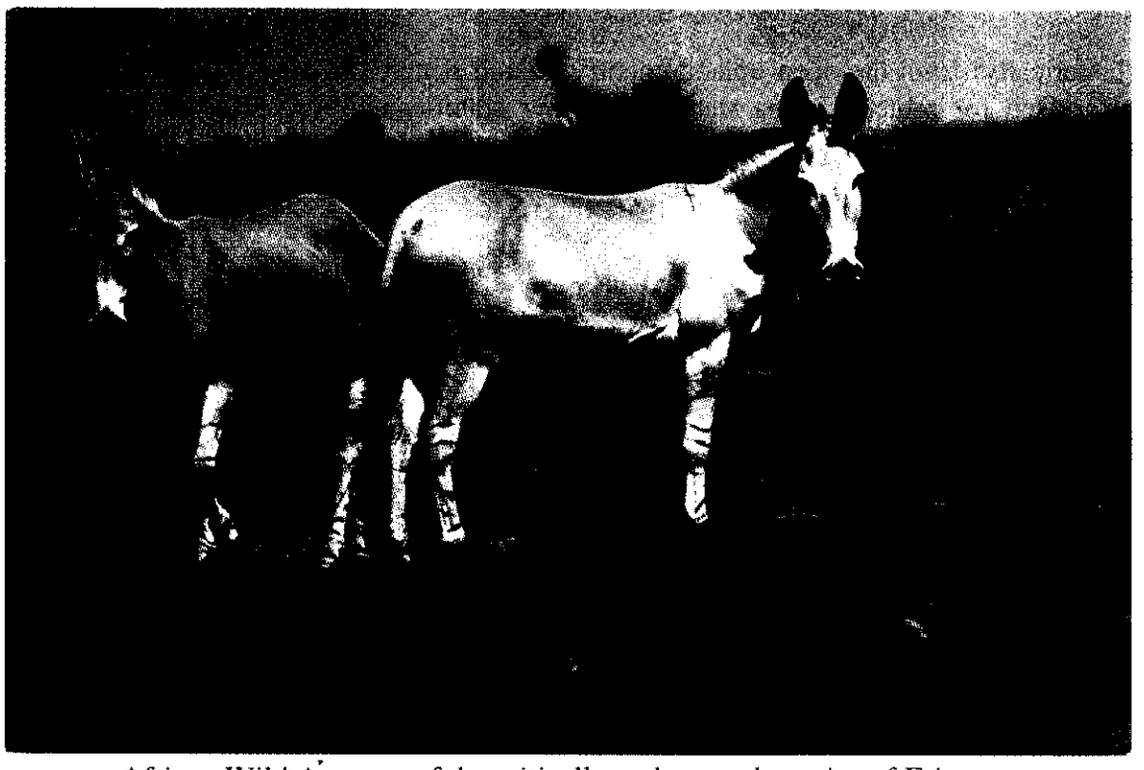
Status category	Definition	Number of species
Critical (E)	Not reliably recorded since 1990 and certainly, or almost certainly, extinct in Eritrea	9
Critical	Not reliably recorded since 1990 but known from anecdotal (second-hand) evidence	9
Endangered	Known from less than 10 sighting and/or from less than 3 separate locations since 1990	13
Rare	Known from between 10 and 50 sighting and/or from between 3 and 10 separate locations since 1990	11
Common	Known from more than 50 sighting and/or from more than 10 separate locations since 1990	20
Unknown status	Not identifiable due to nocturnal habit, small size, lack of identification features, etc.	64*
Total		126

*This total includes three species (Brown and Black Rat and Domestic Mouse) which are common, but not seen "in the field" by wildlife staff.

Table 2 demonstrates the crucial need for simple investment in improving baseline biodiversity data. Over 50% of mammal species cannot be ranked for status due to lack of knowledge. Only 20 taxa can be considered to be secure in conservation terms. The rest must be considered threatened until further survey work is completed.

Of the seventeen mammal taxa (species/sub-species) listed in 1997 IUCN Red List of Endangered Animals, which appear on the Eritrean checklist, only the Eritrean sub-species of the warthog (*Phacochoerus africanus aeliana*), Soemmerring's Gazelle (*Gazella soemmerringi*) and Dugong (*Dugong dugon*) can be ranked as Common in Eritrea using the criteria above. Four species / subspecies, Gelada (*Theropithecus gelada*), Ethiopian Wolf (*Canis simiensis ruppell*), Walia Ibex (*Capra walie*), Black Rhinoceros (*Diceros bicornis*) are certainly extinct in Eritrea. Two species / subspecies, African Wild Dog (*Lycaon pictus*), Lion (*Panthera leo*) are considered Critical, probably extinct. Three, Hartebeest (*Alcelaphus buselaphus*), Red-fronted gazelle (*Gazella rufifrons*), Nubian Ibex (*Capra ibex nubiana*) are considered Endangered; and two, Elephant (*Loxodonta africana*), African Wild Ass (*Equus africanus*) are considered Rare. Three bat species are of unknown status in Eritrea.

It is also clear that a number of mammals, notably elephant, wild ass, greater kudu, and civet, are in danger of national extinction unless specific measures are put in place to protect them in the short-term.



African Wild Ass: one of the critically endangered species of Eritrea.

This is found in the Northern Red Sea Zone

Birds: A total of 577 bird species are listed in the latest national checklist[5]. This list is a compilation of all known records, some dating back to before 1900. Of the total of 577 species, around 320 are resident, of which about 50% have historical breeding records. Around 150 are Palearctic migrants moving south from Europe to Africa; of these, around 40 species are recorded as breeding in Eritrea. Around 45 are intra-African migrants, a few of which are thought to breed in Eritrea. The remainder are either vagrants or of unclear/unknown status.

Of this possible total of 577, only around 50% have one or more reliable recent sightings (since 1990). This demonstrates the weakness of baseline biodiversity information survey for birds in Eritrea. Some of the "missing" species may be (nationally) extinct; some may be present but truly rare, or vagrants not likely to be observed very often; some may have been mis-identifications.

Eritrea has no known national endemic bird species, but does share up to 13 "regional endemics" with Ethiopia alone. These are unrecorded since 1990 except a flock of about 10 Black-winged Lovebirds recorded at Melezanei in 1997 and two (separate) observations of Golden-backed Woodpeckers at Mai Aini and Segeneyti in 1998 (Dietmar Zinner; field observations). All 13 regional endemic species are recorded

[5] The full checklist is contained in the National Biodiversity Stocktaking Assessment Report available from the DoE.

(historically) from the open upland country around Senafe, an area which has not been prioritised for protected area status. A further significant observation was of 5 Bald (Waldrapp's) Ibis near Massawa in February 1997 (Information from Chris Bowden, RSPB, UK; observation by Charles Dewhurst).

Ostrich: Commonly found in the Eastern Lowlands of Eritrea

Reptiles and Amphibians: Knowledge of biodiversity of reptiles and amphibians is extremely weak. A recent checklist has dramatically improved the historical knowledge-base but recent information is still almost non-existent. A total of 90 reptiles and 19 amphibian species have been recorded for Eritrea - this is almost certainly an underestimate because species which are common and widespread elsewhere in the Horn of Africa do not appear on the Eritrean list. On the other hand, many of the species on the list have been collected only a few times and may well be extinct from Eritrea. There are two possible endemic reptiles and one possible endemic amphibian on the list.

Flora: Although historically, plant biodiversity in Eritrea has been relatively well documented, mush of this information is only available outside of Eritrea (notably in Ethiopia and Italy). Within Eritrea today, plant biodiversity is under-collected and under-studied. The regional Flora of Ethiopia and Eritrea[6] is still incomplete (only four volumes from a projected total of eight are available) and no national plant checklist exists. A number of regional vegetation descriptions exist and are summarised in the Eritrea Biodiversity Stocktaking Assessment Report. In the absence of a national checklist, a

6 Flora of Ethiopia and Eritrea; Volume 2 (Part2): Canellaceae to Euphorbiaceae (26 families); Volume 3: Pittosporaceae to Araliaceae (44 families); Volume 6: Volume 7: Poacae (Gramineae) (600spp.). Addis Ababa, Ethiopia/Uppsala, Sweden.

number of site-specific checklists are included in this report - one list of almost 700 species indicates that considerable plant diversity may persist in human-altered landscapes. A total of 33 tree species have been listed as endangered by the (FWD) of the MoA, but the quantitative basis for this status is not clearly documented.

Other taxa: For all other taxa (e.g. invertebrates and microbes), the level of knowledge of diversity makes compilation of national checklists impossible. There are a few collections of insect, plant and microbe agricultural pests at the Department of Agricultural Research (MOA) and at the University of Asmara; a list of agricultural weeds and insect pests is provided in the Eritrea Biodiversity Stocktaking Assessment Report. This is one of the major gaps to be filled by the relevant institutions in the future.

3.2 Marine Biodiversity

The Eritrean marine and coastal zone is situated in the southern sector of the Red Sea. The Red Sea is an almost enclosed, hot, saline body of water which harbours a flora and fauna partially isolated from the Indo-Pacific Ocean at some time in the last 10-20,000 years. The diversity of the Red Sea is a sub-set of that found in the Indo-Pacific Region, and is beginning to show signs of divergence following isolation, especially amongst the 1248 spp. of fish.

The Eritrean coastal plains are hot, dry and sparsely inhabited. This has contributed to the survival of a relatively pristine coastal and marine environment, of which the coral reefs and their associated fish assemblages represent the most diverse ecosystems in Eritrea. Over 100 birds, 500 fishes and 44 genera of hard corals have been recorded by recent surveys. In addition, the Eritrean coast is inhabited by up to 5 marine turtles, 8 or more cetaceans and the dugong - almost all of these species are of conservation concern globally.

Additional surveys are required to fully establish which of the many mainland coastal and island sites would be the best suited for protected area status[7], but this should be decided before, or in parallel with, any increase in the levels of coral reef- based tourism. The number of coral reef sites of exceptional quality for dive tourism appears to be fairly limited - much of the Eritrea's reef is affected by natural turbidity, sedimentation and storm damage.

Increases in commercial fishing activity, oil and gas production offshore and pollution from onshore industry and urban waste flows all represent potential threats to marine biodiversity. The BSAP process should co-ordinate with the current GEF/MoF project "Conservation management of Eritrea's coastal, marine and island biodiversity", to ensure that appropriate safeguards are put in place to protect a natural resource with great conservation value and significant sustainable revenue-earning potential.

[7] Three sites have been prioritised for protected area status and conservation management under the GEF/MoF project "Conservation management of Eritrea's coastal, marine and island biodiversity".

Biodiversity in the Eritrean waters of the Red Sea

Schools: Species of fish in large groups in the Eritrean waters of the Red Sea

Butterfly Fish in healthy coral ecosystem of the Eritrean waters of the Red Sea

Mangroves: Source of food and shelter for marine organisms and birds

3.3 Agricultural Biodiversity:

Agricultural biodiversity is defined as the variability among living organisms associated with agriculture: these include plants (utilised as food/feed, industrial, spices, medicinal, etc.), the wild relatives of these plants, animals, weeds and microbial. The diversity exists between species and within species in a given ecosystem.

Eritrea possesses highly variable agro-climatic condition with elevations ranging from below sea level to about 2600 m. and temperature from semi-desert hot to warm, mild to temperate. There are two rainy seasons, one between June and September covering the greatest part of the country and the other from November to March covering the eastern and southern escarpment and the coastal zone. These climatic and geographic variations create favourable conditions for the growth of different cultivated crop plants. Peasant farmers, who follow traditional farming systems for centuries, have passed on the genetic diversity of these crops from generation to generation. Thus, a considerable amount of agricultural biodiversity is still being conserved *in-situ*. The importance of genetic diversity in the increase of agricultural production need not be overemphasised.

Peasant farmers, who practice traditional farming systems, for centuries, have conserved landrace genetic materials *in-situ* and a considerable amount of it is still present. Off course, especially during the last 50 years due to artificial and natural calamities (war, drought and pests) plants, animals and ecosystems have been seriously affected by genetic erosion. Currently, to increase production for food self-sufficiency, the government started to implement new farming system (Integrated Farming System - Tumur Hirsha) since 1997 and appropriate measures should be taken to prevent agro-biodiversity decline. Thus, the present capacity of *ex-situ* storage of crop genetic resources must be strengthened and supplemented by a strong *in-situ* conservation program through appropriate projects.

N.I. Vavilov visited the northern highlands of Ethiopia, including Eritrea, in 1927. His writing confirmed these areas as one of the Vavilovian centres of diversity for a number of crops. These include, among others, barley, emmer, other tetraploid wheat, oats, flux, safflower, chickpea, lentil, grass pea, pea, horse bean, rape and mustard[8].

Taff and noog are believed to be Abyssinian domesticates[9], which include mainly the highlands of Ethiopia and Eritrea. A wild progenitor of cultivated taff known as *E. pilosa* is found in Eritrea, and other wild species could also exist in Eritrea. Although noog used to be grown widely in the central highlands of Eritrea in the past, its cultivation has now diminished quite significantly.

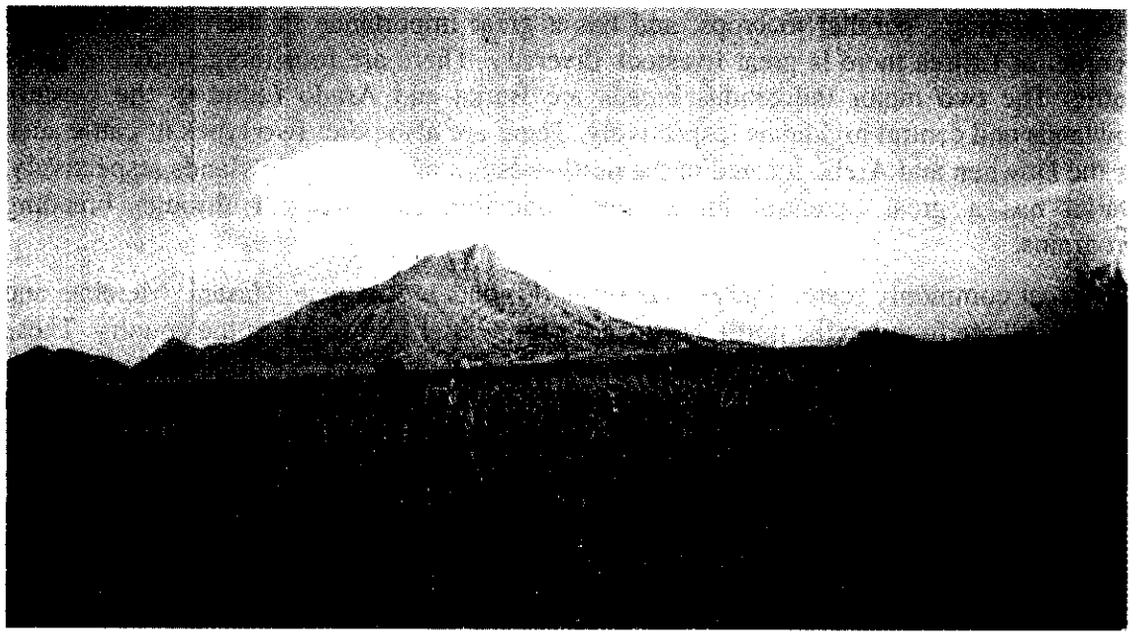
Eritrea is one of the possible areas of domestication for cultivated sorghum, the major crop in the country. The north east quadrant of Africa below the Sahara in the Ethiopio-Sudan region, which definitely includes Eritrea, is the region where the greatest variation of the genus *Sorghum* is found[10], and this strongly implies that Eritrea is a possible centre of origin for cultivated sorghum.

[8] Harlan,J.(1969). Econonic Botany 23, pp.309-313
[9] Et.al
[10] Dogget,H.(1988). Sorghum, 2 ed,.Longman Scientific and Technical.

Work on the collection and conservation of crop species in Eritrea started in 1905 with the start of some research activities at the Agricultural Research Station at Paradiso in Asmara [11]. Thereafter, information has also been documented for important cereals as indicated below:-

- A monograph of cereals collected in Eritrea[12].
- Classification of wheat varieties collected in Eritrea and Ethiopia[13].
- Classification of taff[14].
- Classification of barley[15].
- Studies on various food crops and other plants of economic importance grown in Eritrea in research stations and observation sites between 1905 - 1938[16].

After independence, the Government of Eritrea initiated the establishment of a Plant Gene Bank, administered under the Ministry of Agriculture, for the collection and documentation of local Eritrean landraces. The Gene Bank now holds more than 1200 accessions of cereals, legumes and oil crops.



Sorghum: The most diverse cereal crop in Eritrea

[11] Brrdi, G. (editor), 1947. Rome. Istituto Agricolo Coloniale Firenze "L'agricultura nella colonia Eritrea e l'opera dell'Italia."
[12] Chiovenda, E., 1912. La collezione dei cereali della Colonia Eritrea. Monogr. e Rapp.Colon. Roma.
[13] Vavilov, N.I., 1929. Wheats of Ethiopia. Bulletin of applied Botany, Genetics and Plant Breeding. 20:224-356.
[14] Ciferri, R. and Baldrati, I. 1939. I cereali dell'Africa Italiana II "Teff" (Eragrostis teff). Firenze, 1939 - XVIII.
[15] Ciferri, R., 1940. Saggio di classificazione degli orzi con speciale riguardo a quelli Etiopici. Firenze, Italia. 29 Ottobre 1940 - XIX.
[16] Baldrati.I., 1950.Trattato delle Coltivazioni tropicali e subtropicali pp.1-615. Editore, Ulrico Hoepli. Milano, 1950.

Wheat: Commonly grown in the highlands of Eritrea

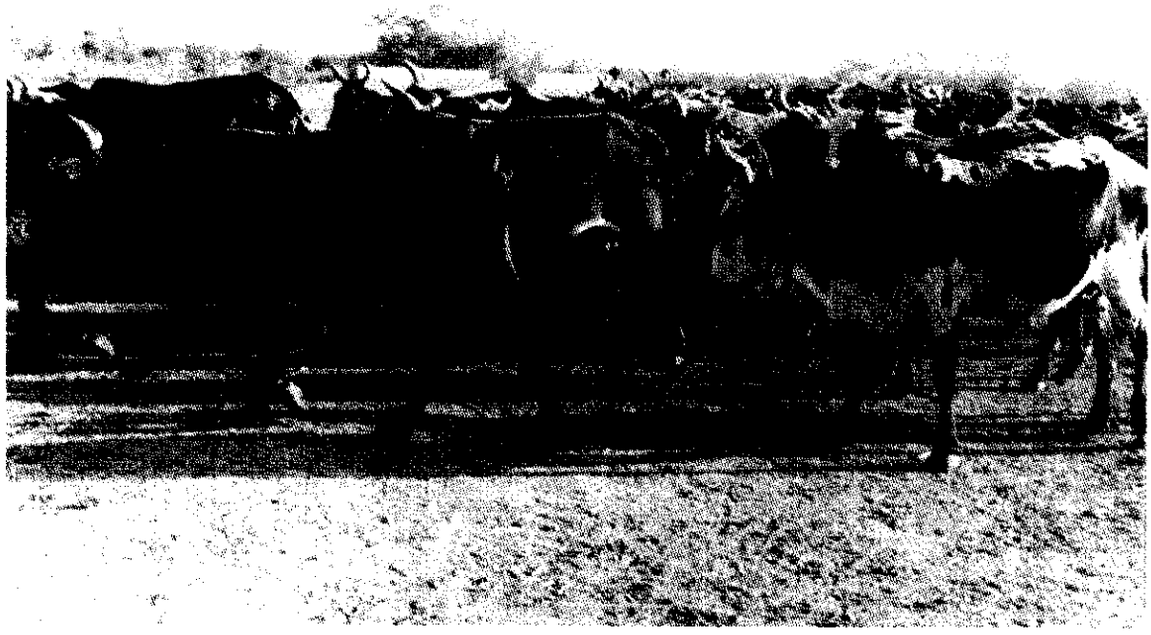
Livestock:- The production system of subsistence farmers is mostly agro-pastoralism and mixed farming , parallel to crops, and has a great importance in the economy of the people. In Eritrea there is great livestock diversity. There are four indigenous breeds of cattle. The two major indigenous breeds are Barka and Arado found in the western lowlands and central highlands respectively. There are also other two types of cattle such as the Dowhen and Arebo located in the north-western and eastern lowlands respectively. Barka has a great potential for future production improvement through breeding programs.

The most commonly reared indigenous types of goats are Langae, Hasani, Merebae and Habab. All are found in the north, north and south western lowlands of the country. These are famous for their high milk yield, which ranges from 1.5 to 2.5 litres per day. There are also many types of indigenous sheep. Some of them are Gerej, and Dereshawit, both found in the north eastern part of Gash-Barka region; Hamale, found in the Northern Red Sea region and the Shmejana sheep are found in the southern region of the country. There are two types of donkeys, the lowland donkey (Rifa'i) and the highland donkey. Mules and horses are confined to the central highlands. The widely known camel types are the Ariri, Arho and Rashaidi. They are distributed in the Gash-Barka, Anseba and Northern and Southern Red Sea regions.

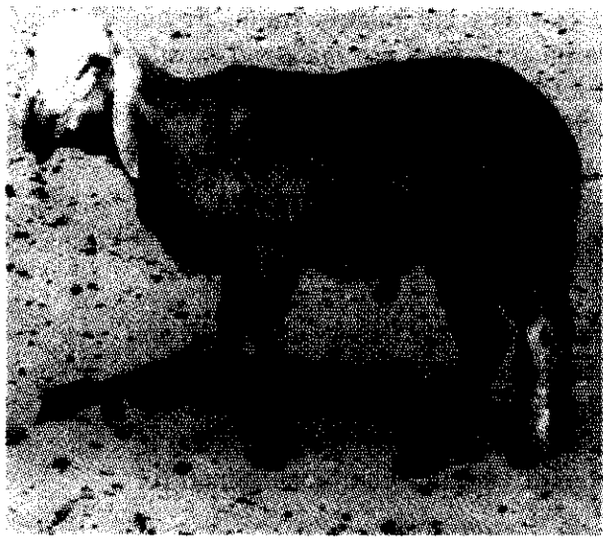
Poultry production and bee keeping are important livestock production activities. The local poultry breeds are non-descript where feather colours, body sizes and productivity are varied. However, adequate knowledge about the types of bird varieties that exist in the country is not well established. Although the local birds are not high yielding, they could be improved through breeding with exotic varieties and better management practices. It is estimated that there are 1.13 million indigenous poultry population in the country.

Bee keeping is also a very important activity. Bee colonies are mainly found in the central highlands and in the eastern and western escarpments; bees are managed mostly under traditional system but modern hives are being introduced in order to improve the quality and quantity of honey and wax production. No work has been done so far to gather information about the types of bee that exist in the country. From a biodiversity point of view, this is an important task to be carried out in the future. Bees are important not only for the production of honey and wax but also ecologically important in the transfer of pollen between plants.

At present, the diversity of indigenous livestock species is relatively intact - all breeds are still widely distributed, population numbers are increasing and the rate of introduction of improved stock from overseas is low. However, there is a need to characterise the indigenous breeds more clearly as part of the national livestock improvement program in order to guarantee that the best characters of the different varieties can be sustained for future breeding work.



Dowhen Cattle: Common breed in the north western and eastern lowlands of Eritrea



Deresh Sheep: Common types
in North-Eastern part of Gash Barka Zone

Nara Sheep: Common types
in the Gash Barka Zone

Ariri Camel: Common in Gash-Barka Zone of Eritrea

SECTION 4

ASSESSMENT OF THE NATIONAL POLICY, LEGISLATIVE AND INSTITUTIONAL FRAMEWORK IN VIEW OF ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION

A detailed assessment of the present policy, legislative and institutional framework for overall environmental protection, and biodiversity conservation and sustainable use in particular, is provided in a separate report: "Assessment of the National Policy, Legislative and Institutional Framework and its Implications for Biodiversity Conservation and Sustainable Use", which was prepared as part of the National Biodiversity Strategy and Action Plan. This report is summarised below.

4.1 National Constitution

The National Constitution of the State of Eritrea was ratified on 23 May 1997. Article 6 states that "unity in diversity" is a basic principle guiding national development objectives. Article 8 mandates the State to work for sustainable development and to "manage land, air, water and natural resources in a balanced and sustainable manner" and to "secure the participation of the people in safeguarding the environment". The Constitution thus provides the foundation for a national development policy based on sustainable principles and the maintenance of diversity.

4.2 National Development Policy

The National Development Plan of the State of Eritrea has recently been revised and updated as the National Economic Policy Framework and Program (NEPFAP), covering the period 1998 - 2000. NEPFAP provides a framework for implementation of the Macro-Policy Statement of November 1994 [1]and contains many statements which influence biodiversity conservation and sustainable use.

The NEPFAP is clear in its major development policy. This is:

- *"to rebuild the war-ravaged economy"*; by
- *"establishing the legal, social and institutional framework required for achieving rapid economic, social, cultural and political development"*; with
- *"a strong focus on developing human capital internally and through the return of Eritreans currently residing overseas"*; thus
- *"creating an enabling policy environment for private sector development to generate a private sector-led market economy"*. (Source : adapted from NEPFAP; Page1-2; 11).

[1] The Macro-Policy Statement was the most important statement guiding national development between 1994-1998

Environmental policy and biodiversity conservation and sustainable utilisation must work in harmony with this overall development policy. The NEPFAP itself contains a number of strong statements about environmental policy, notably the following:

- ***"restoration, enhancement, and preservation of Eritrea's ecological integrity"*** .

This objective is to be achieved through:

- *"prudent utilisation of land, forest, air and water resources;*
- *establishment of sound environmental standards;;*
- *introduction of sustainable land management practices;*
- *adoption and implementation of a comprehensive national environmental policy framework;*
- *sustainable exploitation of Eritrea's fishery resources; and*
- *monitoring and protection of Eritrea's Red Sea coastline".*

The newly-established Ministry of Land, Water and Environment, "*in collaboration with other relevant agencies of government and the private sector*", is identified as taking a leading role in "*protecting, restoring and enhancing the environment*", also with "*developing standards, and taking steps to ensure that environmentally sustainable practices are pursued in Eritrea's economic endeavours*".

(Source: NEPFAP, adapted from page 33-37).

NEPFAP also lays out the policy objectives and strategy for the main economic sectors, including agriculture, fisheries, manufacturing, energy and mining, tourism, infrastructure, health and education.

4.3 Implications of the National Development Policy for biodiversity conservation and sustainable use

Achieving the multiple objectives set out in NEPFAP represents a major challenge to the government, the private sector and the people of Eritrea. In many other countries, rapid economic growth has, historically, been incompatible with "restoration, enhancement and preservation of ecological integrity", for the simple reason that economic growth has been achieved through the unsustainable exploitation of natural resources and a decline in overall environmental quality, especially biodiversity.

For this not to happen in Eritrea, practical mechanisms must be found to resolve the potential conflict between pure expansion of the economy and a more balanced form of social and economic development, thus ensuring a pathway towards sustainability. Each of the different sectors of the economy has the potential to have either positive or

negative impacts on biodiversity and sustainable use through the implementation of their development program. The majority of the sectors have stated, explicitly or implicitly, that environmental protection will be a part of their development program. But, achieving economic expansion and environmental protection at the same time will be a difficult challenge, requiring extensive consultation and collaboration between different sectors. The NBSAP, if implemented properly, can provide a framework for achieving this reconciliation.

4.4 Legislative framework for biodiversity conservation and sustainable use

At independence, all Ethiopian and other residual legislation was repealed. This created a legislative "vacuum" which the Government has been working to fill. The legislative framework for the State of Eritrea is in a process of rapid development. In the interim period, different government sectors are operating on the basis of (temporary) Legal Notices, Directives and Regulations, whilst working to prepare their formal legislation (Proclamations). A remarkable feature of the social cohesion of the country at present is that, even in the absence of formal legislation, hunting, poaching, unauthorised cutting of trees, etc. are not serious threats to biodiversity in most parts of the country.

At present, there is no formal environmental legislation for Eritrea – an Environment Proclamation is in preparation by the Department of Environment. Previous draft forms of the Environment Proclamation and a Biodiversity Proclamation have been subjected to further in depth review.

The absence of formal environmental legislation does not mean that the environment, including biodiversity, has no legal status. Recently promulgated legislation for other sectors contains a number of key articles, which have the potential to provide strong protection for the environment and biodiversity. These are summarised briefly here, in chronological order of gazettement.

Proclamation to Reform the System of Land Tenure in Eritrea, to Determine the Manner of Expropriating Land for Purposes of Development and National Reconstruction, and to Determine the Powers and Duties of the Land Commission No.58/1994

This proclamation defines the Government's ownership of all land, with only usufructary rights for individuals. This gives the Government great power to use land in ways which can have positive or negative impacts on biodiversity. Under Article 50 of this proclamation, the Government can appropriate land for "*forestry and animal conservation projects*", amongst others. There have been long delays in implementing this proclamation, which has the potential to improve land management with respect to biodiversity by eliminating the traditional *diesa* land management system that does not encourage tree planting and maintenance.

Proclamation to Promote the Development of Mineral Resources No. 68/1995

This Proclamation, in association with the Regulations of Mining Operations (Legal Notice 19/1995), provides the framework for the development of both commercial and artisanal mining in Eritrea; this includes extraction of mineral waters, brine and geothermal energy.

The legislation lays out some general requirements for environmental management and protection which, if fully implemented and enforced, would ensure that mining operations do not have unnecessary negative impacts on biodiversity. The legislation is, however, only as strong as compliance and enforcement allow it to be. In addition the legislation contains exemption clauses which effectively make all environmental protection subject to decisions of the Licensing Authority.

Regulations on Petroleum Operations Legal Notice No. 24/1995

These Regulations lay down the framework for development of the petroleum industry in Eritrea. Environmental protection is covered comprehensively in Article 11: Environment, Pollution Control and Safety Measures. This legislation has the potential to provide strong protection of the environment if well implemented. One potential weakness of the legislation, from a biodiversity perspective, is the lack of an explicit requirement of regular reporting of biodiversity monitoring data, which could be used to monitor environmental performance.

Proclamation 72/1995: A Proclamation to Provide for the Control of the Business Licensing System and for the Establishment of a Business Licensing Office.

This legislation creates a framework for regulation of the growing small-scale business sector in Eritrea and gives a wide range of powers to different "competent regulatory authorities". The main role of the Business Licensing Office (BLO) is to act as "clearing house" for license applications. The distribution of National Environmental Assessment Procedures and Guidelines by the Ministry of Land Water and Environment in June 1999 requires the acquisition of environmental clearance by project owners, without which the BLO is not expected to issue business licenses. From a biodiversity perspective, threats might arise from location of businesses in relatively biodiverse habitat, or from unsustainable utilisation of natural resources.

Proclamation for the Establishment of Local Governments No. 86/1996

This Proclamation is an important part of the Government's policy of regional decentralisation of administration and, more importantly, control and implementation of development policy; this has major implications for biodiversity conservation and sustainable use.

This Proclamation lays down clear responsibilities for environmental protection at the regional level and highlights the need to ensure that any policy for biodiversity conservation and sustainable use is implemented at the same level of decentralisation as the rest of the national development program.

The Press Proclamation No 90/1996

The Press Proclamation provides a legal framework for freedom of information within Eritrea. There are a number of restraints however, which seem to require that the majority of information about biodiversity, and the environment in general, be generated and disseminated by Eritrean-owned private businesses, or through Government agencies, with the Ministry of Information playing an important supervisory role. The Ministry of Information has the potential to be a major facilitator of the dissemination of biodiversity-related information and those sectors concerned with biodiversity conservation and sustainable use should work closely with this Ministry.

Fisheries Proclamation No 104/1998

The legislation covering the fisheries sector comprises two Proclamations and five Legal Notices (Regulations), all promulgated in May 1998. These laws provide comprehensive coverage of the marine sector in Eritrea and contain a number of Articles relevant to biodiversity conservation and sustainable use. From a biodiversity perspective, the legislation covering the fisheries sector is quite comprehensive. The largest potential weaknesses lie in the lack of clarity with regard to integration of the responsibilities of the Ministry of Fisheries with other government sectors in sustainable coastal management. This could lead to some problems of co-ordination and also restrict ability to respond to broader sectoral interests.

This weakness could be reduced if the composition of the Fisheries Advisory Council were broadened, at least to include the Ministry of Land, Water and Environment. In addition, the mechanism for the creation of protected species and protected areas is not described fully – without a formal procedure, this part of the legislation may be difficult to put into practice.

Draft Legislation

At present, there are only draft laws for the water sector, the forest and wildlife sector and the environment. Until these laws are promulgated, biodiversity conservation in Eritrea may be critically weak – finalisation of these laws and their promulgation must be a priority for the relevant sectors.

SECTION 5

THE PRINCIPAL COMPONENTS OF THE STRATEGY AND ACTION PLAN

As described above in Section 3, the NBSAP process has been undertaken mostly within three core areas (Terrestrial, Marine and Agricultural biodiversity). This reflects the need to fit with the existing institutional structure; however, careful attention has been paid to those issues which cut across different core areas.

The principal components of the National Biodiversity Strategy and Action Plan are the statements that comprise the Goal, Objectives, Strategic Elements and Actions of the Plan. These statements form an internally consistent, closely linked hierarchy that creates a logical pathway from high-level principles to activities on the ground.

Table 3. The hierarchy of terms used for the National Biodiversity Strategy and Action Plan

Term	Definition	Example
Goal	Ultimate end point - where we want to be but not easily measured	Conservation of Eritrea's biological diversity improved
Objective	A sub-set of the overall goal, restricted to a defined more easily quantified end-point	100 ha of degraded land rehabilitated for use as conservation area
Strategy	A broad level description of the mechanism by which an objective is achieved	Planting of indigenous tree seedlings in named closure areas
Activities	The individual steps which have to be taken to implement a strategy	Establish nursery, germinate seedlings; plant out; employ teams for planting and watering

5.1 Goal

The overall goal of the Eritrean National Biodiversity Strategy and Action Plan is as follows:

"The overall biodiversity of Eritrea restored, conserved and managed so that it provides environmental services and natural resources that contribute to sustainable and socially-fair national economic development".

The goal makes clear the "desired endpoint" of the NBSAP following implementation, and reflects three major elements of the overall environmental situation in Eritrea which merit special mention:

- the need for environmental recovery from the overall degradation of natural resources generated by the long struggle for independence, periodic and severe drought conditions;
- the need for active intervention, in the form of environmental management, in order to increase the benefits flowing from biodiverse natural resources to the national economy;
- recognition that there exists a potentially complementary relationship between national economic development, people and biodiversity.

This overall goal will be achieved if the Action Plan outlined in this document is fully and successfully implemented. It is expected that this will occur within the next 10 years, with the majority of the activities being substantially put in place within the next 5 years. It is recognised that some activities, such as planting of indigenous trees, will not yield their full biodiversity benefits within a 10-year time frame, even if full implementation has occurred.

5.2 Objectives

A major objective for each core area has been developed and is presented here. Each major objective provides the key linkage between the overall goal and the strategic elements that guide the activities to be undertaken by different sectors. The major objective for each core area is given below:

5.2.1 Terrestrial Biodiversity

"Rehabilitation of degraded terrestrial ecosystems and their components through a combination of natural succession; protected area establishment and management; and sustainable use of terrestrial biodiversity resources".

5.2.2 Marine Biodiversity

"The coastal, marine and island biodiversity of Eritrea conserved and human activity managed to promote the sustainable development and optimal use of these resources".

5.2.3 Agricultural Biodiversity

"Agricultural biodiversity-resources conserved and utilised sustainable for food security, income generation and agriculture, whilst ensuring the socially-fair distribution of benefits arising from the use of national agricultural biodiversity resources".

The three objectives above provide the first layer of elaboration of the overall biodiversity goal, making the goal statement more relevant to each of the three core areas, and providing the link to the strategic elements below.

The objectives provide one level at which quantification of the overall success of the strategy could be measured, although the lack of strong baseline data will make objective quantification of success difficult. Each of the three main objectives needs to be further "broken down" into a number of strategic elements – these strategic elements represent the major areas of activity for implementation of the NBSAP and provide a better basis for monitoring and evaluation.

5.3 Strategic Elements

The strategic elements of the NBSAP form the linkage between the major objective for each core area and the activities that will be undertaken in order to fulfil the objective. The strategic elements "breakdown" the objective into a series of more practically-oriented statements which better "fit" the institutional structure of the implementing agencies.

For convenience and clarity, the strategic elements have been reduced to 10 headings or themes. The themes may have more or less relevance to the three core areas and thus may contain none, one or more elements.

The 10 themes are:

- Integrated management
- Sustainable use of natural resources
- Alien invasive species
- Pollution management

- *In-situ* conservation (protected areas)
- *Ex-situ* conservation
- Taxonomic knowledge
- Information acquisition and storage;
- Public awareness and education;
- Legal and institutional structure (capacity building).

The strategic elements for each core area are presented below. Each strategic element will be implemented through the activities to which it is linked. Some activities are existing components of government programs, or other activities undertaken by government or private agencies. Some strategic elements may lead directly to a single institution and even a single activity, but in many cases, the strategic element will be achieved successfully only through the implementation of a number of inter-linked activities, possibly involving a range of different institutions – here, the strategic element "binds together" the individual activities of different sectors and creates the framework for greater collaboration.