

**NATIONAL BIODIVERSITY  
STRATEGY AND ACTION PLAN  
FOR ERITREA**

**Prepared by  
The Department of Environment  
Ministry of Land, Water and Environment**

**Asmara**

**August 2000**

**Photographs appearing in the National Biodiversity Strategy and Action Plan  
were obtained from the Ministry of Agriculture and Ministry of Fisheries**

---

## FOREWORD

The importance of having a national biodiversity strategy and action plan need not be over emphasised. Given our past history, there was a complete neglect and mismanagement to our natural resources in general and to biodiversity resources in particular. The environmental scenario in Eritrea is featured by one of the most severe land degradation, deforestation, decreasing wildlife populations, loss of habitat, etc. Relatively speaking it may be argued that our coastal and marine biodiversity resources remained stable as compared to our terrestrial and agro-biodiversity resources. This does not mean, however, that there was sound marine environment protection and management practices put in place. This is due to the fact that there was not any meaningful program of activities to exploit marine biodiversity resources.

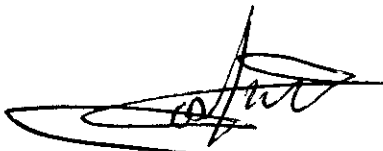
To reverse the situation, it is only after Eritrea's independence that the Government took the initiative to institute certain policy and practical measures to rehabilitate and restore the degrading environment. The preparation of the National Biodiversity Strategy and Action Plan (NBSAP) is a continuation of the Government efforts and is a step forward with respect to biodiversity conservation for a sustainable use. The NBSAP presents Eritrea's overall policy position with respect to biodiversity conservation and attempts to place this policy in the context of the Government's major development objectives for the next few years. The Ministry of Land, Water and Environment commits itself to facilitate, promote, and co-ordinate the implementation process of biodiversity conservation activities for a sustainable use.

The preparation of the NBSAP also demonstrates Eritrea's readiness to implement the provisions of the Convention on Biological Diversity (CBD), under whose obligation the NBSAP is prepared. We believe that the strategy and action plan identified in the NBSAP, while addressing national needs and priorities, will at the same time contribute to global biodiversity conservation and sustainable use. Nevertheless, national biodiversity planning and management capacity should be increased and strengthened if such contributions are going to be effective. The CBD should then endeavour to strengthen these capacities through its established financial mechanisms.

---

It is to be realised that the NBSAP will require adequate financial support for its implementation. We, thus, consider the Global Environmental Facility (GEF) and its implementing agencies, including the World Bank, United Nations Development Program and the United Nations Environment Program to be important partners in our endeavour to implement biodiversity conservation programs. In this connection we take this opportunity to humbly express our vote of thanks to the financial support made by the Global Environment Facility (GEF) for preparing the NBSAP and also to the World Bank for effectively implementing this support.

The NBSAP could not have been successfully produced without the active participation of all those institutions involved in the process. We wish then to express our full appreciation to the efforts made by concerned government agencies and others, while asking our sincere apologies for not being able to list all the names.



*Woldemichael Gebremariam,*

*Minister of Land Water and Environment*

*July 2000*

---

## ACRONYMS

|           |  |
|-----------|--|
| AMRF:     | Assessment and Management Riverine Forest                          |
| CAAS:     | College of Agriculture and Aquatic Sciences                        |
| CBD:      | Convention on Biological Diversity                                 |
| COP:      | Conference of Parties  |
| CMI:      | Coastal and Marine Islands   |
| CPT:      | Core Planning Team   |
| DANIDA:   | Danish International Development Agency                            |
| DARHRD:   | Department of Agricultural Research and Human Resource Development |
| DOE:      | Department of Environment  |
| ECDF:     | Eritrean Community Development Fund                                |
| EEA:      | Eritrean Environment Agency  |
| EEQ:      | Environmental Evaluation Questionnaire                             |
| EIA:      | Environmental Impact Assessment                                    |
| ER:       | Eritrea  |
| EAFRINET: | East Africa Biosystematics Network                                 |
| FAO:      | Food and Agriculture Organisation                                  |
| FWD:      | Forestry and Wild Life Division                                    |
| GDP:      | Gross Domestic Product   |
| GEF:      | Global Environment Facility  |
| GIS:      | Geographic Information System                                      |
| GOE:      | Government of Eritrea  |
| ICIPE:    | International Centre for Insects and Pests Ecology                 |
| ICARDA:   | International Centre for Agricultural Research in the Dry Areas    |
| ICRAF:    | International Centre for Research and Agro-Forestry                |
| ICRISAT:  | International Crops Research Institute for the Semi-Arid Tropics   |
| IDA:      | International Development Agency                                   |
| ILCA:     | International Livestock Centre for Africa                          |
| IPGRI:    | International Plant Genetic Resources Institute                    |
| IPM:      | Integrated Pest Management   |
| IUCN:     | World Conservation Union   |

---

|         |  |
|---------|--|
| MARPOL: | International Convention for the Prevention of Pollution from Ships            |
| MBF:    | Department of Marine Biology and Fisheries (UOA)                               |
| MEM:    | Ministry of Energy and Mines   |
| MOA:    | Ministry of Agriculture  |
| MOD:    | Ministry of Defence  |
| MOE:    | Ministry of Education  |
| MOF:    | Ministry of Fisheries  |
| MOH:    | Ministry of Health   |
| MOI :   | Ministry of Information  |
| MOJ:    | Ministry of Justice  |
| MOLG:   | Ministry of Local Government   |
| MOT:    | Ministry of Tourism  |
| MLWE:   | Ministry of Land Water and Environment   |
| MSY:    | Maximum Sustainable Yield  |
| MTC:    | Ministry of Transport and Communication  |
| MTI:    | Ministry of Trade and Industry   |
| MICMEC: | Ministry of International Co-operation Macro Policy and Economic Co-ordination |
| NBSAP:  | National Biodiversity Strategy and Action Plan                                 |
| NDVI:   | Normalised Difference Vegetation Index   |
| NEMP-E: | National Environmental Management Plan for Eritrea                             |
| NEPFAP: | National Economic Policy Framework and Program                                 |
| NGO's:  | Non-Governmental Organisations   |
| NUEW:   | National Union of Eritrean Women   |
| NUEYS:  | National Union of Eritrean Youth and Students                                  |
| PGRU:   | Plant Genetic Resource Unit  |
| EPFDJ:  | Eritrean People's Front for Democracy and Justice                              |
| RUG:    | University of Groningem  |
| SOS:    | Save Our Soul  |
| WHO:    | World Health Organisation  |
| UNDP:   | United Nations Development Programme   |
| UNEP:   | United Nations Environment Programme   |
| UOA:    | University of Asmara   |

## TABLE OF CONTENTS

|                         |  |           |
|-------------------------|--|-----------|
| Foreword.....           |  | i         |
| Acronyms .....          |  | iii       |
| Table of contents ..... |  | v         |
| Executive Summary ..... |  | vii       |
| <b>Section 1.</b>       | <b>Introduction.....</b>   | <b>1</b>  |
| 1.1                     | Background and context .....   | 1         |
| 1.2                     | The Convention on Biological Diversity (CBD) .....   | 2         |
| <b>Section 2.</b>       | <b>Country Profile .....</b>   | <b>3</b>  |
| 2.1                     | Location .....   | 3         |
| 2.2                     | Population .....   | 3         |
| 2.3                     | Climate and geography .....  | 3         |
| 2.4                     | Government .....   | 4         |
| 2.5                     | Economy .....  | 4         |
| <b>Section 3.</b>       | <b>The Status of Biodiversity in Eritrea .....</b>   | <b>7</b>  |
| 3.1                     | Terrestrial Biodiversity .....   | 8         |
| 3.1.1                   | Terrestrial Biodiversity at the Ecosystem Level .....  | 8         |
| 3.1.2                   | Terrestrial Biodiversity at the Species Level .....  | 13        |
| 3.2                     | Marine Biodiversity .....  | 17        |
| 3.3                     | Agricultural Biodiversity .....  | 20        |
| <b>Section 4.</b>       | <b>Assessment of the National Policy, Legislative and Institutional Framework<br/>in view of Environmental Protection and Biodiversity Conservation ..</b> | <b>25</b> |
| 4.1                     | National Constitution .....  | 25        |
| 4.2                     | National Development Policy .....  | 25        |
| 4.3                     | Implications of the National Development Policy for biodiversity<br>conservation and sustainable use.....  | 26        |
| 4.4                     | Legislative framework for biodiversity conservation and<br>sustainable use .....   | 27        |

|            |   |    |
|------------|---|----|
| Section 5. | The Principal Components of the Strategy and Action Plan .....      | 30 |
| 5.1        | Goal .....  | 31 |
| 5.2        | Objectives .....  | 31 |
| 5.2.1      | Terrestrial Biodiversity.....                                       | 31 |
| 5.2.2      | Marine Biodiversity.....  | 32 |
| 5.2.3      | Agricultural Biodiversity .....                                     | 32 |
| 5.3        | Strategic Elements .....  | 32 |
| Section 6  | Biodiversity-related Activities for Terrestrial Biodiversity .....  | 34 |
| 6.1        | Integrated management .....   | 34 |
| 6.2        | Sustainable use of natural resources .....                          | 37 |
| 6.3        | Alien invasive species .....  | 40 |
| 6.4        | Pollution management .....  | 42 |
| 6.5        | <i>In-situ</i> conservation (protected areas) .....                 | 43 |
| 6.6        | <i>Ex-situ</i> conservation .....                                   | 45 |
| 6.7        | Taxonomic knowledge .....   | 46 |
| 6.8        | Information acquisition and storage .....                           | 47 |
| 6.9        | Public awareness and education .....                                | 48 |
| 6.10       | Legal and institutional structure (capacity building) .....         | 49 |
| 6.10.1     | Legislation .....   | 49 |
| 6.10.2     | Institutions (capacity building) .....                              | 50 |
| Section 7. | Biodiversity-related Activities for Marine Biodiversity .....       | 52 |
| 7.1        | Integrated management .....   | 53 |
| 7.2        | Sustainable use of natural resources .....                          | 54 |
| 7.3        | Alien invasive species .....  | 55 |
| 7.4        | Pollution management .....  | 56 |
| 7.5        | <i>In-situ</i> conservation (protected areas) .....                 | 56 |
| 7.6        | <i>Ex-situ</i> conservation .....                                   | 59 |
| 7.7        | Taxonomic knowledge .....   | 59 |
| 7.8        | Information acquisition and storage .....                           | 60 |
| 7.9        | Public awareness and education .....                                | 61 |
| 7.10       | Legal and institutional structure (capacity building) .....         | 62 |
| Section 8. | Biodiversity-related Activities for Agricultural Biodiversity ..... | 64 |
| 8.1        | Integrated management .....   | 65 |
| 8.2        | Sustainable use of natural resources .....                          | 67 |
| 8.3        | Alien species .....   | 70 |
| 8.4        | Pollution management .....  | 72 |
| 8.5        | <i>In-situ</i> conservation .....                                   | 73 |
| 8.6        | <i>Ex-situ</i> conservation .....                                   | 74 |
| 8.7        | Taxonomic knowledge .....   | 76 |
| 8.8        | Information acquisition and storage .....                           | 77 |
| 8.9        | Public awareness and education .....                                | 78 |
| 8.10       | Legal and institutional structure (capacity building) .....         | 78 |



---

## **Executive Summary**

This first Eritrean National Biodiversity Strategy and Action Plan (NBSAP) has been prepared over an extended period from June 1997 until July 2000 and presents Eritrea's overall policy position with respect to its biodiversity, the sum total of ecosystem, species and genetic diversity that lies within Eritrean territory.

The NBSAP builds upon the Government's previous commitment to broader environmental protection, as contained in the 1995 National Environmental Management Plan – Eritrea (NEMP-E). The NBSAP covers a range of existing and ongoing biodiversity-related activities taking place within different sectors of the economy.

An important principle of the strategy is that the most appropriate niche for biodiversity-related activities in Eritrea lies within the existing policy framework for sustainable economic development. The NBSAP attempts to place biodiversity policy in the context of the government's major development objectives for the next five years.

Environmental activities already form a prominent part of the Government development policy. Given the limited financial and human resources capacity available in Eritrea, the NBSAP seeks to integrate and co-ordinate these activities to increase their effectiveness for biodiversity conservation, rather than replace or add to them. Biodiversity-related activities must be made compatible with those designed to improve human welfare in Eritrea.

There are many situations where these two goals are complementary and can even be self-reinforcing. The NBSAP focuses on these "win-win" opportunities, plus those interventions which are considered to be essential to meeting the obligations to which Eritrea has committed itself to undertake the Convention on Biological Diversity (CBD), which the State of Eritrea formally approved on 21st March 1996.

---

The Department of Environment of the Ministry of Land, Water and Environment has been appointed by the Government to be the co-ordinating agency for biodiversity-related activities of the country. However, it is emphasised here that this NBSAP represents a joint commitment by all relevant authorities and agencies within the government, at both national and regional level.

The NBSAP comprises four major parts.

The first part, (Section 2 Country Profile), describes the broad geographic and socio-economic context of Eritrea within which any biodiversity strategy must be positioned. This section provides information on the geography of Eritrea and also on the main socio-economic systems across the country.

The second part, (Section 3 The Status of Biodiversity in Eritrea), documents what is currently known about the distribution and condition of biodiversity across both terrestrial and marine environments. Although Eritrea is not a biodiversity “hotspot”, it does contain a wide range of ecosystem types within a small geographic area. This diversity is an important component of Eritrea’s potential as a tourist destination. At the species level, Eritrea is home to a number of globally rare and endangered species (e.g. African Wild Ass; Nubian Ibex) as well as being part of one of the world’s major centres of crop diversity. These plant genetic resources have the potential to make a major contribution to national and global agriculture.

The third part of the NBSAP (Section 4 Assessment of the National Policy, Legislative and Institutional Framework in view of Environmental Protection and Biodiversity Conservation) reviews the evolving policy, legislative and institutional framework within which conservation and sustainable use of biodiversity must be effected in Eritrea. The policy and legislative framework in Eritrea is still developing since independence; this provides an important opportunity to introduce effective action for biodiversity conservation and sustainable use in an integrated

---

manner through the entire economy<sup>1</sup>.

The fourth, and most important, part of the NBSAP consists of four inter-linked sections which describe the major components of the strategy and action plan.

The first part (Section 5 The Principal Components of the Strategy and Action Plan) describes the programmatic elements of the NBSAP. These elements are described under 10 themes: 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 final three sections (Section 6: Biodiversity-related Activities for Terrestrial Biodiversity; Section 7: Biodiversity-related Activities for Marine Biodiversity; and Section 8: Biodiversity-related Activities for Agricultural Biodiversity) describe the principal activities which are considered to be essential elements of an effective programme for biodiversity conservation and sustainable use in Eritrea.

A total of 42 activities are described for improving conservation and sustainable use of terrestrial biodiversity. The majority of these are on going activities which would benefit from additional funding – others are new planned activities for which funding has yet to be allocated. Implementation of existing and planned activities would be undertaken by a range of government agencies at national and regional level.

A total of 31 activities are described for improving conservation and sustainable use of marine biodiversity. Biodiversity-related activities in this sector are dominated by the on-going programme of activities being undertaken by the Government of Eritrea as part of the Global Environment Facility-funded Conservation

---

<sup>1</sup> These three parts of the NBSAP are summaries of information contained in additional, more detailed reports: (i) The Eritrea Biodiversity Stocktaking Assessment Report, (ii) the Eritrea Biodiversity Economic Assessment and (iii) the Assessment of the National Policy, Legislative and Institutional Framework in view of Environmental Protection and Biodiversity Conservation, which are available from the Department of Environment.

---

Management of Eritrea's Coastal, Marine and Island (CMI) Biodiversity project. Responsibility for implementation of this project lies with the Ministry of Fisheries in close collaboration with other relevant sectors.

A total of 28 activities are described for improving conservation and sustainable use of agricultural biodiversity. Biodiversity-related activities in this sector are closely linked to the vital need to improve agricultural productivity and food security. The judicious use of agro-biodiversity resources can improve the livelihoods of the majority of Eritreans who are still dependent on low-intensity agriculture, while at the same time contributing to the conservation of globally-important plant genetic resources which have been developed over many years by Eritrean farmers.

The activities described in this first National Biodiversity Strategy and Action Plan represent the minimum set of actions considered necessary to ensure that Eritrea's biodiversity is maintained intact and can make a contribution to the economic development of the country for present and future generations. Successful implementation of the strategy will require strong commitment from the highest level of the government and a high level of co-operation and co-ordination between many institutions so that biodiversity conservation and sustainable use becomes integrated into the overall national development.

## SECTION 1

### INTRODUCTION

#### 1.1 Background and Context

This National Biodiversity Strategy and Action Plan (NBSAP) has been prepared over an extended period from June 1997 until July 2000. As part of the NBSAP process those important assessment reports have also been prepared. These include:- 1. Eritrea Biodiversity Stocktaking Assessment Report and 2. Eritrea Biodiversity Economic Assessment.

The NBSAP presents Eritrea's overall policy position with respect to biodiversity and attempts to place this policy in the context of the government's major development objectives. The NBSAP presented here has adopted a pragmatic approach to what might realistically be achieved over the next 7 - 8 years with respect to biodiversity conservation and sustainable use. The NBSAP builds upon the Government's previous commitment to broader environmental protection, as contained in the 1995 National Environmental Management Plan – Eritrea (NEMP-E). Wherever possible, the activities and interventions recommended in the NBSAP expand and build upon this management plan, especially its Section B.2 (2.5) on Natural Heritage and Biological Diversity.

In addition, the NBSAP includes a range of existing activities already taking place within different sectors. Environmental activities already form a prominent part of the Government development policy – given the limited financial and human resource capacity available, the NBSAP seeks to integrate and co-ordinate these activities to increase their effectiveness for biodiversity conservation, rather than replace or add to them.

Similarly, it is implicit in the NBSAP that the most appropriate niche for biodiversity-related activities in Eritrea is within the existing framework of sustainable economic development. Put simply, biodiversity-related activities must be made compatible with those designed to improve human welfare in Eritrea. Fortunately, there are many situations where these two goals are complementary and even self-reinforcing. The NBSAP focuses on these “win-win” opportunities, plus those interventions which are considered to be essential to meeting the obligations to which Eritrea has committed itself to undertake the Convention on Biological Diversity (see below).

From time to time, this programme of activities can be expanded to suit the changing conditions. This is considered to be a more sensible response to the present situation than creating an over-ambitious wish-list with little practical chance of implementation.

## 1.2 The Convention on Biological Diversity (CBD)

The State of Eritrea formally approved the Convention on Biological Diversity (CBD) on 21st March 1996. Eritrea has been a participant at recent meetings of the Conference of Parties (COP) and supports international community attempts to reverse the overall global decline of biological diversity through the activities of the CBD.

In 1996, the Eritrean Environmental Agency (EEA) was named as the government institution responsible for co-ordinating Eritrea's activities under the Convention. In 1997, the EEA was restructured as the Department of Environment (DoE) in the newly created Ministry of Land, Water and Environment (MLWE) of the State of Eritrea. The DoE has assumed responsibility for co-ordination of CBD-related activities within Eritrea, although biodiversity-related activities are implemented by a wider range of government and public agencies.

Under the CBD, Eritrea has, like other signatory countries, agreed to a number of specific obligations and opportunities for enhancement of biological diversity conservation and sustainable use<sup>1</sup>.

Amongst the obligations are the following:

- preparation of a National Biodiversity Strategy and Action Plan (Article 6);
- identification and monitoring of components of biological diversity important for its conservation and sustainable use (Article 7); and
- preparation of regular reports on measures taken for the implementation of provisions of the Convention (Article 26).

These three obligations form part of a long-term commitment to activities that conserve and promote sustainable use of biodiverse natural resources within member countries.

---

<sup>1</sup> The full text of the Convention on Biological Diversity may be obtained from the DoE on request.

## SECTION 2

### COUNTRY PROFILE

#### 2.1 Location

Eritrea, Africa's youngest independent nation, declared its independence on May 24<sup>th</sup> 1993, two years after the end of a 30- year liberation struggle. It lies in the north-eastern corner of the Horn of Africa, bordered by Sudan to the west, Ethiopia to the south, Djibouti to the south-east, and the Red Sea to the east. The country is defined by borders created in a series of agreements signed between colonial powers and adjacent countries during the period from 1900-1908<sup>1</sup>. The total land area is approximately 124,320 km<sup>2</sup>, including over 350 islands<sup>2</sup>.

#### 2.2 Population

The total population of Eritreans is estimated at around 3.5 million, with up to 1 million of these living overseas. The annual population growth rate is estimated at between 2.7 and 3%. The population consists of nine ethnic groups: Tigrigna (50.4%), Tigre (31%), Saho (5%), Afar (5%), Hidareb (2.5%), Bilen (2.1%), Kunama (2%), Nara (1.5%), and Rashaida (0.5%), each with its own language and cultural diversity. The population is approximately 50% Christians (majority Orthodox and minority Roman Catholics plus Protestants) and 50% Muslims. Ethnic, religious and gender parity is a strong element of national government policy – harmony between Christians and Muslims has contributed to the strong national unity within the country.

#### 2.3 Climate and Geography

The highlands have a cool temperate climate while the lowlands are characterised by a hot and humid climate, especially along the coast. Eritrea is in the Saharan rainfall zone and receives its heaviest rains from the south-west monsoons. In normal years, rainfall varies from an annual average of 400 mm to 650 mm in the highlands and from 200 mm to 300 mm in the lowlands. Over half of the total land area is unsuitable or marginal for agriculture due to steep topography or lack of reliable rainfall. A more complete description of the Eco-geography of the country in relation to biodiversity knowledge is provided in Section 3 below and also in the Eritrea Biodiversity Stocktaking Assessment<sup>3</sup>.

---

<sup>1</sup> Habtu Ghebre-Ab (1993) Ethiopia and Eritrea : a documentary study. Red Sea Press, Trenton NJ, USA

<sup>2</sup> DoE(1997) State of the Environment –Eritrea (Pilot Report)

<sup>3</sup> Copies of the National Biodiversity Report may be obtained from the DoE.

## 2.4 Government

The National Constitution, approved and ratified on 23<sup>rd</sup> May 1997, establishes the National Assembly as “the supreme representative and legislative body of the State of Eritrea” (Article 31) with “a duty to enact an electoral law” to “ensure the representation and participation of the Eritrean people” (Article 30). The first National Assembly was elected in early 1997 and elections are to be conducted every 5 years.

Administratively, the country is divided into six *Zobas*, or regional administrations, which replaced the previous nine administrative provinces (*Awraja*) in 1996. As the country moves towards a decentralised system of government, the zoba administrations are responsible for implementing policies (economic and social) which have been developed in collaboration with the central government.

## 2.5 Economy

The economy could be described as a regulated free market<sup>4</sup> – the overall development goal being “the establishment of a dynamic private sector-led market economy” with the role of the government restricted to “maintaining law and order, and sound macroeconomic policies, and to undertaking critical investments in strategic sectors of the economy”<sup>5</sup>

Economic recovery between 1992 and 1998 has increased per capita GDP from below \$150 to around \$190. Agriculture accounts for around 30% of GDP and also a large part of the subsistence economy; the contribution of agriculture to GDP fluctuates widely with the success of each harvest and is highly dependent upon annual rainfall.

Over 70 percent of Eritrea’s people are rural and depend for their livelihood on traditional subsistence agriculture, including crop farming, mixed agro-pastoralism and pure pastoralism. Average family plot size in the highlands is 1-1.5 hectares and around 2-3 ha. in the lowlands. Although up to 3.2 million hectares of land is estimated to have potential for agriculture<sup>6</sup>, only around 14% is cultivated at present (~450,000 ha; the exact figure varies from year to year). Only around 20,000 hectares is under irrigation.

Forestry and fishing currently account for less than 5% of GDP; artisanal fishing also makes a large contribution to the informal subsistence sector of the coastal economy. Historically, the fishing sector peaked in the 1950s at a catch of 25,000 tonnes when there were around 20,000 fisher-folk. Currently, the artisanal sector lands around 700 tonnes per annum; the commercial sector increased to 3,773 tonnes in 1995, but crashed to just 38 tonnes in 1997. The total maximum sustainable yield (MSY) from the Eritrean Red Sea continental shelf area of 52,000 km<sup>2</sup> is estimated at around 65,000 tonnes (Fisheries Sector Report, 1999).

Eritrea’s industrial base is still extremely narrow and is made up mostly of small- and medium-scale consumer-goods producing industries (food, beverages, leather goods, textiles, etc.)

---

<sup>4</sup> Many prices have been deregulated but price controls remain on flour and bread, petroleum products, utility prices, and rents for government houses.

<sup>5</sup> National Economic Policy Framework and Program, 1998

<sup>6</sup> This figure is regarded as a very optimistic estimate by some experts.



whose technology is largely out of date as a result of neglect of investment during the long war. Industry and manufacturing accounted for around 25% of GDP in 1995 but production of this sector was increasing by around 50% per annum.

A summary of key physical, economic and social indicators is included in Table 1 below.

**Table 1. Selected Physical, Economic and Social Indicators for Eritrea**

| Parameter                     | Measure | Unit                                       |
|-------------------------------|---------|--|
| Land Area                     | 124,320 | km <sup>2</sup>                            |
| Forested                      | 1       | %  |
| Coastline                     | 1900    | km   |
| Continental shelf             | 52,000  | km <sup>2</sup>                            |
| Per capita GDP                | 160-190 | US \$                                      |
| <u>Social Indicators</u>      |         |  |
| Population                    | 3-3.5   | Million                                    |
| Population Growth Rate        | 2.7-3.0 | % per annum                                |
| Rural                         | 70-80   | %  |
| Population Density            | 24-28   | per km <sup>2</sup>                        |
| Crude Birth Rate              | 47      | per 1000                                   |
| Crude Death Rate              | 18      | per 1000                                   |
| Life expectancy at birth      | 46      | Years                                      |
| Total Fertility Rate          | 6.8     | Number of children per child bearing women |
| Contraceptive prevalence rate | <1      | %  |
| <u>Health</u>                 |         |  |
| Infant Mortality              | 135     | per 1000 live births                       |
| Under 5 mortality             | 203     | per 1000 live births                       |
| Under-5s underweight          | >41     | %  |
| Access to immunisation        | 27      | %  |
| Maternal mortality rate       | 710     | per 100,000 births                         |
| Population                    | 28,000  | per physician                              |
| Population                    | 10,000  | per hospital bed                           |

(Table 1. continued) Selected Physical, Economic and Social Indicators for Eritrea

| Parameter                                      | Measure | Unit                     |
|--|---------|--------------------------|
| <u>Water</u>                                   |         |                          |
| Access to safe water                           | 8       | %                        |
| Access to sanitation services                  | 14      | %                        |
| Urban population access to sanitation services | 44      | %                        |
| Rural population access to sanitation services | <1      | %                        |
| <u>Nutrition</u>                               |         |                          |
| Average daily intake                           | 1,750   | calories per capita      |
| <u>Education</u>                               |         |                          |
| Female literacy rate                           | 10      | %                        |
| Adult literacy rate                            | 20      | %                        |
| Primary school enrolment                       | 47.4    | % of relevant population |
| Junior secondary enrolment                     | 22.4    | % of relevant population |
| Secondary school enrolment                     | 13.7    | % of relevant population |
| Pupils (Primary)                               | 37      | per teacher              |
| Pupils   | 68      | per textbook             |
| <u>Infrastructure</u>                          |         |                          |
| Telephone lines                                | 0.37    | per 100 inhabitants      |

Source: World Bank (1996) IDA Country Assistance Strategy Paper (15324-ER)

---

## SECTION 3

### THE STATUS OF BIODIVERSITY IN ERITREA<sup>1</sup>

The biodiversity of Eritrea may be described conveniently under three core areas:

- the natural terrestrial habitats characteristic of the region;
- the diverse agro-ecosystems which have developed as a result of traditional agricultural activities in the region; and
- the coastal marine and island ecosystems of the Red Sea.

The status of biodiversity across these three core areas is not known precisely at present. It is clear that throughout the 20<sup>th</sup> century, growing human influence, amplified by war and drought<sup>2</sup>, has placed increasing pressure on the natural terrestrial biodiversity of the country. Similarly, the agro-biodiversity associated with indigenous, traditional farming systems has been disrupted severely by the same forces. By contrast, the marine ecosystems of the Eritrean Red Sea region have been much less affected by these pressures and are ecologically relatively intact.

Although the long-term trend in biodiversity status in Eritrea over this century has been negative, there are encouraging signs of improvement over the recent past decade. Between 1991 and 1998, the overall status of wild terrestrial biodiversity in Eritrea has improved, albeit from rather poor initial condition. This improvement has resulted from the cessation of armed conflict, the war of independence that lasted for 30 years, and a sequence of relatively good years of rainfall. This period of stability has allowed both natural habitat and agricultural systems to recover from their degraded state<sup>3</sup>. The period of relative stability and good rainfall has also contributed to the success of efforts to intensify agricultural production, increasing the (man-made) threat to some agro-biodiversity. In the marine sector, the increase in economic activity has proceeded fairly slowly and threats to marine biodiversity are still relatively localised (e.g. pollution impacts around Massawa and Asseb).

During the same time period (1990-99), empirical knowledge about biodiversity in Eritrea has increased, but from a very low baseline level. Thirty years of institutional neglect during the liberation struggle left Eritrea with few trained botanists, zoologists, ecologists, etc. who have the skills required to document biodiversity in detail. In spite of this limitation, Eritrea has made some progress towards establishing an information base upon which rational biodiversity planning can begin. The sections below, derived mostly from reports compiled during the NBSAP process, summarise this growing knowledge.

---

<sup>1</sup> A full report of the status of biodiversity in Eritrea can be found in the National Biodiversity Stocktaking Assessment Report, available from the DoE.

<sup>2</sup> There was widespread drought in much of Eritrea during the 1940's, 1960's and 1970s; few data are available for 1980-1990; since 1990, more complete records have been maintained.

<sup>3</sup> The border conflict with Ethiopia could have reversed this trend in the conflict zones and its immediate environs.

### 3.1 Terrestrial Biodiversity

Terrestrial biodiversity is defined here as the natural biological systems occupying the land area of Eritrea, excluding the marine systems and also the biodiversity associated with agricultural systems. Obviously, there is a good deal of overlap between these systems, especially with regard to extensive rangeland and the coastal plains and islands of the Red Sea.

#### 3.1.1 Terrestrial Biodiversity at the Ecosystem Level

Few studies of ecosystem biodiversity (*sensu stricto*) have been completed in Eritrea but a number of national land use classifications have been developed. Eco-geographical, agro-ecological, and vegetation cover classifications have been produced at coarse scales. These classifications capture the main regional ecological variations within the country but provide little detailed information about the species diversity, which exists within these regions. In almost all cases, the level of ecological/biodiversity information about particular ecosystems and habitats (e.g. *Juniperus* forest, riverine forest, coral reefs, traditional farming systems) is incomplete and in many cases historical and unlikely to reflect the current situation.

The Department of Land in the Ministry of Land, Water and Environment has classified Eritrea into 6 agro-ecological zones on the basis of altitude, temperature and rainfall regime and other agricultural factors (see Figure 1). These zones correspond broadly with the ecological zones produced by FAO (1997) from aggregate Normalised Difference Vegetation Index (NDVI) data derived from NOAA-AVHRR satellite images (see Figure 2). The agro-ecological zones clearly demonstrate the over-riding influence of available water on vegetation productivity. The latter is likely to correlate strongly with overall biodiversity richness, although it is likely that each agro-ecological zone will contain some plant and/or animal species/varieties not found in any other zone. This means that full biodiversity conservation will require that a minimum area of natural habitat is maintained under natural conditions in each agro-ecological zone. Fortunately, the six agro-ecological zones correlate, to a reasonable extent, with the six new regional administrative boundaries. Regional implementation of a national biodiversity conservation policy could provide an effective mechanism for ensuring that the maximum amount of diversity is maintained as efficiently as possible.

Figure 1: Agro-ecological Zone Map (1998)

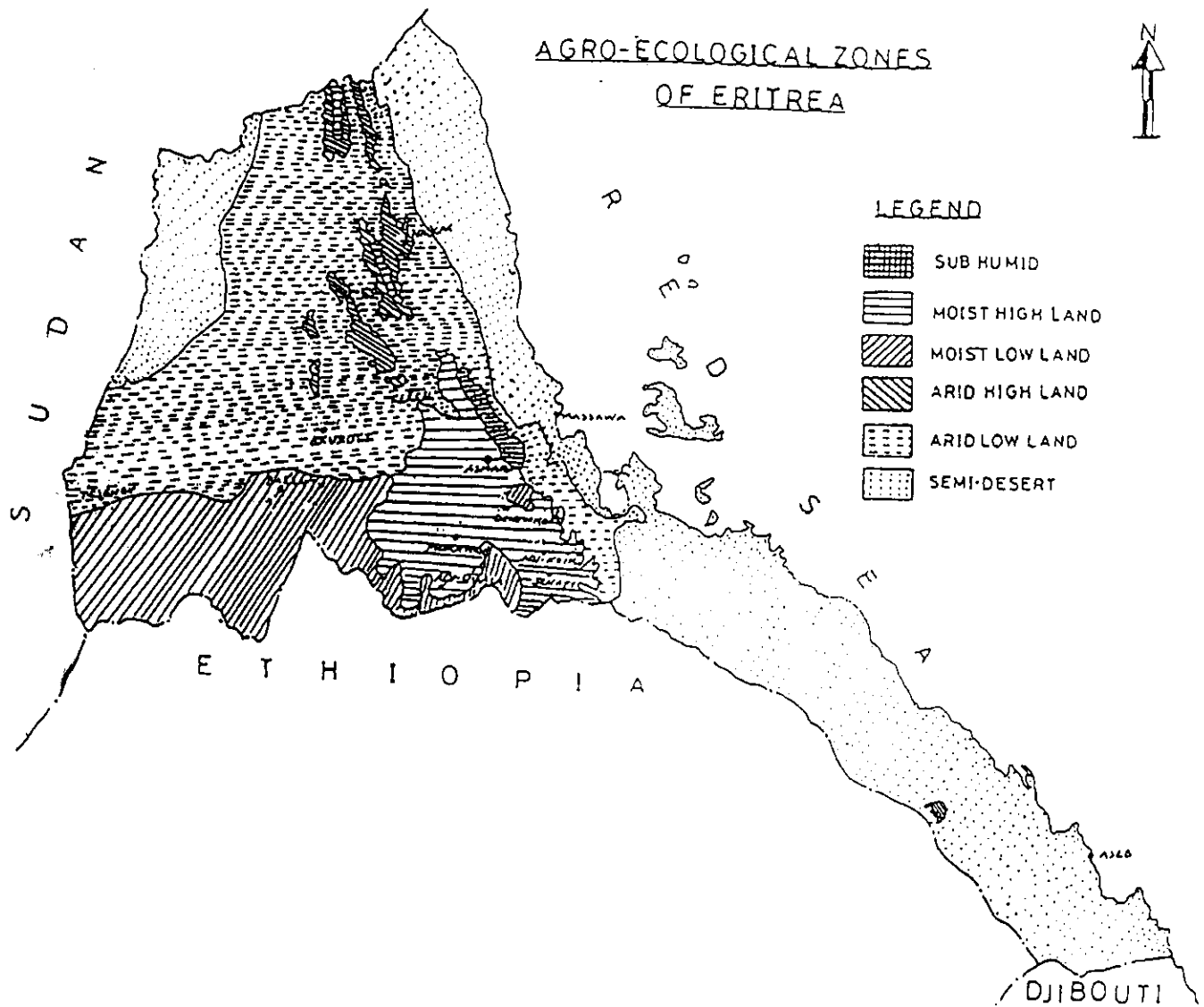
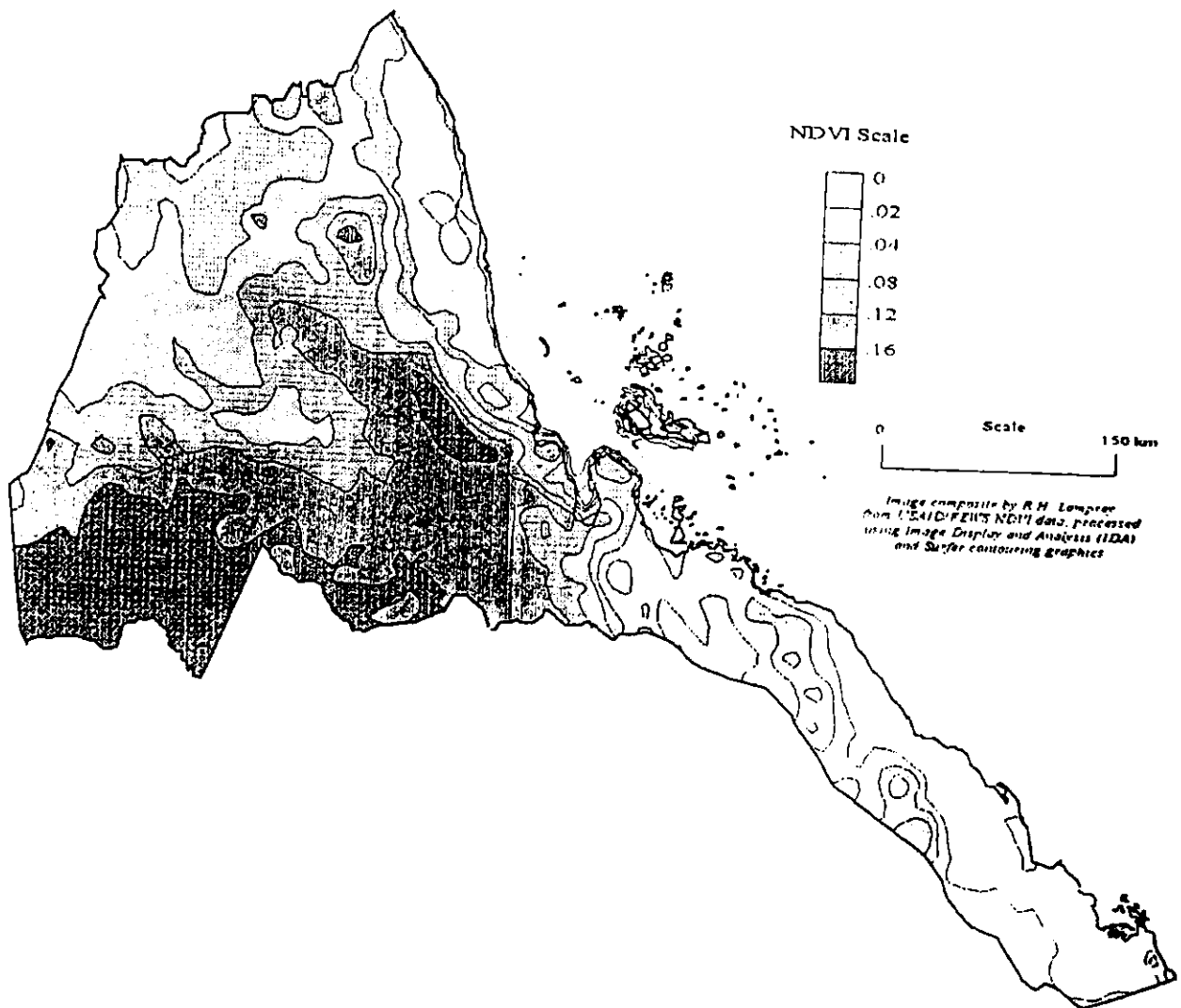


Figure 2: NDVI Vegetation Production Map of Eritrea



Currently, Eritrea has no formal protected areas, which are legally gazetted, although a number of potential locations have been identified and partially surveyed. It is unlikely that more detailed biodiversity information will change these priorities, although additional locations may be identified. The absence of formal protected areas does not mean that land is not being conserved in Eritrea. Up to 1999, around 192,734 ha<sup>4</sup> of land has been placed under partial or complete closure (i.e. protection from human utilisation for fuelwood/grazing) through joint agreements between local communities and the Ministry of Agriculture. Although much of the land was placed under enclosure, because it was degraded to some extent, it still represents a significant area of potentially valuable land for biodiversity conservation – many closures are showing clear signs of increase in vegetation cover, but their biodiversity status is not being adequately monitored at present.

At this time, the status of natural terrestrial ecosystem biodiversity in Eritrea can be summarised conveniently under three broad categories:

Low biodiversity, but stable: Much land in Eritrea, for example, most of Agro-ecological zones namely Arid Highland, Arid Lowland and Semi-desert (see Fig 1), currently has very low human population density and use. This situation is likely to remain the same for the near future at least and the biodiversity status of such regions can be considered to be relatively stable. These areas are quite similar ecologically and mostly low in terms of biodiversity richness, although they may contain interesting and important endemic species in particular places (see below). The major threats to biodiversity in these areas are drought, fire and overgrazing.

Moderate biodiversity and threatened: The land in Agro-ecological zones namely Sub-humid, Moist Highland and Moist Lowland has a higher overall level of biodiversity due to increased rainfall. This higher potential productivity also makes the land more suitable for agriculture and thus for associated human habitation and the additional pressures which this brings. In these areas, the potential for conflict between biodiversity conservation and sustainable use and conversion to alternative uses is high. Careful planning and strong management will be required to avoid unnecessary loss of biodiversity. All of the key “pressure-point” locations identified in this NBSAP belong to this category.

Degraded land: Land of this type may be found in most agro-ecological zones, but degraded land within zones namely Sub-humid, Moist Highland and Moist Lowland is the most significant from a biodiversity perspective. Degraded land in these zones is likely to continue to lose its remaining biodiversity if it is left unmanaged. Active intervention of some kind is required to restore this land to a self-sustaining, ecologically useful condition (either as natural habitat or as productive land for agriculture).

---

<sup>4</sup> Area estimate provided by MoA: March 2000



Northern Eastern Escarpment: Part of the remaining ever green forest of Eritrea



Regeneration of vegetative cover under closure system