

SECTION 6

BIODIVERSITY-RELATED ACTIVITIES FOR TERRESTRIAL BIODIVERSITY

Terrestrial biodiversity is defined, for the purposes of the NBSAP, as all land area still dominated by “relatively natural habitats”. This includes those areas which are used as unimproved range land and also areas with low density human presence (small settlements and agriculture in a predominantly unaltered landscape) – this may comprise around 75% of the total land area. The review is arranged under the 10 strategic themes – for each strategic theme, the existing situation, needs and NBSAP activities are presented.

6.1 Integrated management

Existing situation: Integrated management of natural terrestrial habitat for biodiversity objectives is not occurring in Eritrea at present. The fundamental reasons for this are: (i) lack of a centralised national database containing the necessary physico-geographical and sociological information; (ii) lack of adequate information about the biodiversity status of large parts of the country; and (iii) a relatively new central and regional administration with little practical experience of planning at this scale. This places severe limitations on the amount of large-scale planning and integrated decision-making which can be undertaken at present.

In spite of these limitations, a number of separate activities demonstrate that, in the future, integrated, landscape-level biodiversity management may become more effective in Eritrea. These are discussed below.

(i) Establishment of a national land capability classification scheme

The Department of Land, Ministry of Land, Water and Environment intends to extend its pilot land classification scheme to the whole country. The scheme is based on 8 land-use categories, derived from field estimates of slope; soil depth; soil texture; erosion hazard; drainage class; stoniness; and management type. Pilot surveys undertaken around Asmara have been used to create land-use plans, which include zonation for residential, commercial, industrial, arable and conservation purposes. It is difficult to see how the existing labour-intensive scheme can be extrapolated to the entire country, but a similar scheme making more use of remote sensed data and including some simple biodiversity indicators might provide a useful basis for integrated planning¹.

¹ The land classification scheme plans to include conservation areas as one of its land categorisations (see in situ conservation).

(ii) Increased digitization of other planning information

A number of ministries in Eritrea are now digitising information in the form of GIS databases. For example, the Department of Mines maintains an accurate GIS map of all mining concession areas (the only mining actually taking place at present is small-scale artisanal), and the Ministry of Local Government has assembled a GIS map of all villages. Outside of Eritrea, there is much information being digitized. The University of Berne, Switzerland has compiled a 23-layer GIS database of topography, watercourses, roads, etc. whilst biologists at the Deutsches Primatenzentrum, Göttingen are assisting the FWD of MOA to initiate mapping of mammal and bird distributions.

(iii) Increased levels of coordinated planning at central and regional level

As the 6 new regional administrations become established and fully-staffed, the level of integrated planning which can take place at the landscape and regional levels will increase. Central government ministries should support regional administrations by ensuring that national-level information and technical assistance is available to the developing administrations.

(iv) Small-scale integrated management projects

The government is gaining experience in implementing projects at a landscape level. From a biodiversity perspective, the most important of these are:

- MoA/SOS Sahel project: Assessment and Management of Riverine Forests, which has now gathered the information required for long-term sustainable management of the Gash and Barka riverine forests, a key biodiversity “pressure point”; long-term funding for implementation of the management plan is now required.
- The MoA closures policy, which covers 192,734 ha. of land, also has the potential to develop into a major feature of the national biodiversity action plan.
- The DANIDA/MoA Integrated Watershed Development Project has also established watershed closures, where after being treated, natural regeneration of indigenous vegetation is reported to be occurring. The project has also planted over 500,000 tree seedlings on 655 ha in hillside terraces, but most of these were exotic species.
- The GEF/MoF project, Conservation Management of Eritrea’s Coastal, Marine and Island Biodiversity is about to begin implementation; this project will include the coastal plains region, which comprises over 50% of the total land area of Eritrea.

Needs: The NBSAP should support and guide the emerging capacity for integrated environmental management by ensuring that information about biodiversity status is available for all planning and project implementation activities decisions. This would be best achieved by ensuring that national biodiversity objectives, such as establishing a representative set of protected areas, are translated into appropriate regional activities. Biodiversity related goals may be best achieved by providing the right kind of biodiversity information to other decision-makers, and through the careful modification of existing programmes, rather than through generation of new isolated projects which may over-stretch the limited capacity of implementing authorities. The NBSAP should support community participation in the decision-making process as to the areas that are to be designated as closure or wildlife protected areas (see Section 6.5). The community should be involved in the management of the closures/wildlife protected areas.

Strategy: To improve integration of biodiversity conservation into integrated land management.

Activities:

Activity	Responsibility (Lead Institution and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) Improved land classification and zonation by completion of National Land Capability Classification	Dept of Land/ DoE, (MLWE)	On-going	Needs additional fund	
(ii) Integrated watershed development by expansion of MoA/DANIDA programme to other watersheds	MoA/DANIDA support programme	On-going		DANIDA
(iii) Integrated Management of Riverine Forests through implementation of management plan produced by AMRF project	MoA/Regional Administration Gash Barka	Planned	Needs funding	
(iv) Completion and implementation of National Action Plan for Combating Desertification	MoA/MLWE	On-going		IGAD/ DANIDA

6.2 Sustainable use of natural resources

Existing situation: Natural resources still play a vital role in the economy of the majority of the population. Almost 80% of total energy consumption is from biomass, mostly as fuelwood/charcoal. About 70 - 80% of the population is dependent upon agriculture and many local communities use wild plants for a range of domestic purposes and to supplement incomes, e.g. doum palm (*Hyphaene thebaica*) and gaba (*Zizyphus spina-christa*). Natural resources, in the form of attractive landscapes, etc. can make a large contribution to the tourist sector if they are not spoilt by careless development.

The pressure on existing natural resources, already weakened by drought and war, is intense. Striking a balance between demand and the need to restrict use to allow regeneration of the resources is a major challenge for the government and the people.

A decrease in the pressure on natural resources can be brought about either by increasing the supply of the resource (supplementation) or by providing alternatives to reduce use of the resource (substitution). Increases in indigenous terrestrial biodiversity can only occur slowly in Eritrea, due to the constraints imposed by large water deficits (evapo-transpiration:rainfall ratios of >4) and poor soils. This places a relatively low upper limit on the rate at which "supplies" of natural resources can be increased – thus resource substitution is essential to relieve pressure on natural diversity.

Among the most important existing initiatives undertaken by the government are the following:

(i) Fuelwood substitution: The government has made major commitments to increasing alternative energy resources. The Liquid Petroleum Gas (LPG) depot at Massawa has been rehabilitated; tariffs on LPG, kerosene and electricity are kept low; the new Hirgigo power station will increase electricity supply by 50% when it is commissioned whilst a rural electrification programme will extend electricity to villages around major towns; and solar and wind power research programmes are underway. A recent pilot project to produce fuel briquettes from cotton stalk waste from the Alighider Estate has the potential to replace 40,000 quintals² of fuelwood; the Alighider Estate can produce enough cotton waste to supply 10 such projects, replacing 40,000 MT of fuelwood.

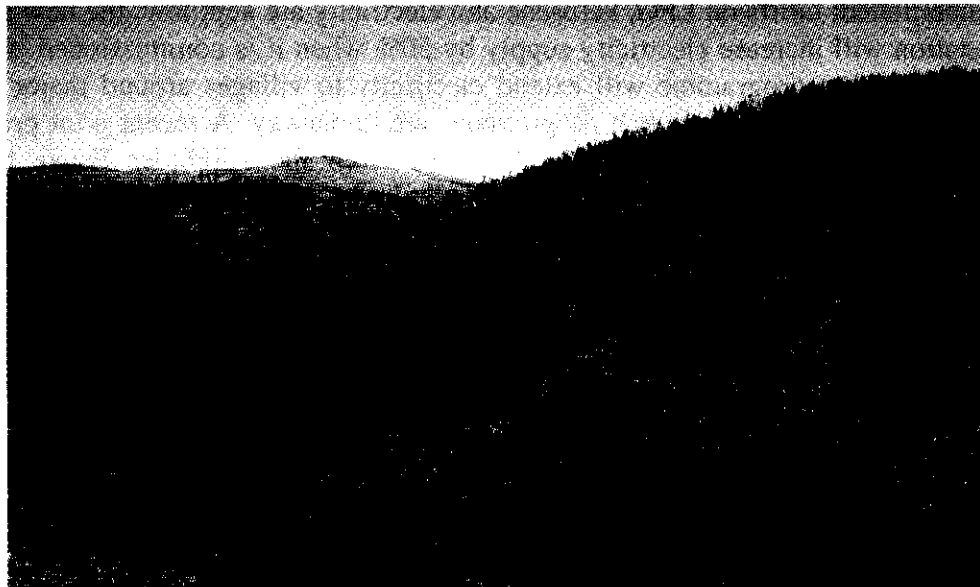
(ii) Afforestation: The FWD of the MoA is responsible for the establishment of new plantations and the reforestation of existing forest areas. To date, a total of 21,163 ha of new plantations have been established, whilst a further 192,734 ha of existing forest is under controlled regeneration. The MoA/DANIDA National Tree Seed Project has a long-term objective of "improved wood production and provision of other benefits from growing woody plants, contributing to the rehabilitation of degraded environments and help meeting the national requirements for timber, poles, fuel, fodder, food and shelter in Eritrea" through "the provision of genetically suitable seed and plant material of good physiological quality from selected seed sources of both indigenous and exotic woody

² 1 quintal is equal to 100kg.

species to meet the present and future needs for tree planting activities in Eritrea in a sustainable way, by strengthening national institutional capacity”.



Community participation in soil and water conservation work in Eritrea



Regeneration of vegetative cover on hillsides

Strategy 1: Reduction of pressure on plants in natural habitat through promotion of alternative fuels.

Activities:

Activity	Responsibility (Lead Institution and Collaborators)	Priority Ongoing or Planned	Funding and other Needs	Funding Agency
(i) Implementation of wood-fuel substitution projects	MoA/MEM	Planned	Needs funding	
(ii) Increased use of improved traditional stoves	MEM	Ongoing		
(ii) Increased use of cotton briquettes	Alighider Estate	Ongoing		GoE

Strategy 2: To increase production of wood-fuel from "converted habitat".

Activities:

Activity	Responsibility (Lead Institution and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) National Tree Planting Campaign	MoA/MoE/ MoLG/MoD	Ongoing	Needs additional funding	
(ii) Afforestation via summer School Programme	MoA/MoE	Ongoing	Needs additional funding	
(iii) Encouraging trees and farming system (tree cultivation and management – community forestry);	MoA	Ongoing	Needs additional funding	

Strategy 3: Promotion of the economic benefits to be derived from non-destructive utilization of trees, etc. in natural habitat.

Activities:

Activity	Responsibility (Lead Institution and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) Survey of traditional plant medicinal use; potential for commercial production	MoH/WHO proposal; also UoA project	Planned	Needs funding	
(ii) Sustainable use of Doum palm	MoA, AMRF project	Planned	Needs funding	
(iii) Sustainable use of Gum Arabic and Resin production from <i>Boswellia</i> trees	MoA/ MTI	On-going	Needs additional funding	
(iv) Survey of distribution and regeneration of <i>Boswellia papyrifera</i>	MoA/MoLG/ MTI	Planned	Needs funding	
(v) Increased honey production through promotion of use of new hives	MoA	Planned	Needs funding	

6.3 Alien invasive species

Existing situation: Eritrea is in danger of being over-run by alien invasive plant species. The fragile and degraded ecology of much of the landscape provides great opportunities for alien invasive plant species to establish themselves and spread. Although less significant at the moment, the spread of annual “weeds” is also likely to occur, as demonstrated by the colonization of the Massawa area by the Indian House Crow (*Corvus splendens*) since its introduction in 1970.

Four alien species can be identified as being of major concern to natural habitat at present: Beles (*Opuntia ficus-indica*); Asha Ghereb (*Nicotiana glauca*); Temr musa (*Prosopis chiliensis*) and Bano (*Xanthium (spinosum) strumarium*). All four species have shown an ability to spread aggressively into natural habitats. *Opuntia ficus-indica* is estimated to cover over 10,000 ha. of the Central Highlands and is now spreading in the western lowlands. *Nicotiana glauca* has spread rapidly into a range of habitats in the last 20 years, especially on disturbed soils near roads, dams, etc.. *Prosopis chiliensis* is believed to have spread spontaneously into Eritrea from the Sudan and is now encroaching into the riverine habitats of Gash-Barka. *Prosopis* is also establishing itself naturally on the eastern coast around Massawa following its deliberate introduction there. *Xanthium spinosum* is widespread at the interface between agricultural land and natural habitat and can be used as an indicator of degraded land.

To date, little action has been taken to study or control the spread of these (or other) plant species. Although immediate “eradication” may not be advisable (or possible) because of the positive socio-economic role played by these species (e.g. harvest of *Opuntia* fruits; use of *Prosopis* for fodder and fuelwood), these species may represent a significant threat to the maintenance of representative natural habitat in the longer-term future.

Needs: The most urgent need is to establish the baseline distribution and rate of spread of all major alien invasive species. This is probably best achieved through surveys coordinated through the Ministry of Local Government and the Regional Administrations. A second priority is to become familiar with potential control options. Successful control of alien invasive species is not an easy or speedily-achieved task. Widely spread species can usually only be controlled cost-effectively using a combination of chemical and biological control. The major alien plant species in Eritrea are all serious pests elsewhere (in Africa) and there exists much experience with control from other countries. This experience is available through the scientific and ‘grey’ literature and through direct contacts with relevant experts. For example, South Africa has long experience with integrated biological and chemical control of *Opuntia* spp., including *O. ficus-indica*. Informal contacts have already provided information about biological control methods which can be made specific to wild-spreading *Opuntia ficus-indica* whilst having no impact on (spineless) cultivated varieties.

Strategy: To increase capacity for the control of alien invasive species within Eritrea.

Activities:

Activity	Responsibility (Lead Institution and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) Survey of distribution and spread of selected alien invasive species and their economic/social benefits;	MoA/MLWE/ UoA	Planned	Needs funding	
(ii) Collection of information on control methods of known and potential invasive and exotic species;	MoA/MLWE/ UoA	Planned	Needs funding	
(iii) The human resources of quarantine and services at points of entry are to be strengthened and improved. All imported varieties of crops to be quarantined at MoA Research Station before release to farmers	MoA	On-going	Needs additional funding	

6.4 Pollution management

Existing situation: At present, pollution does not represent a severe threat to biodiversity in Eritrea. The nature and scale of current industrial activity in Eritrea is not sufficient to have a direct impact on any natural areas of major biodiversity interest. At independence, there were only 42 large scale (public) and 650 small-scale (private) industries in the country, mostly confined to Asmara, Massawa, Dekemhare and Keren. Similarly, the virtual absence of chemical inputs into agriculture means that, at present, little threat to terrestrial biodiversity arises from agricultural practices. In fact, some of Eritrea's most interesting wildlife, especially birds, may be found close to agricultural landscapes. This is almost certainly due to the need to share a common, scarce resource – water.

Pollution management is still developing in Eritrea after years of neglect of the industrial sector. All new industrial projects must pass through the National Environmental Impact Assessment Procedures and Guidelines which are now being implemented, although legislation for enforcement of EIA is not yet promulgated (except in the mining and petroleum sectors). The environmental impact assessment procedures and guidelines contain sufficient screening to adequately protect biodiversity from pollution impacts, especially if project location is carefully chosen and appropriate environmental performance standards are put in place.

Needs: An urgent need is the rapid implementation of the Environmental Impact Assessment Procedures and Guidelines, even in the absence of full legal status. This will bring immediate returns in terms of improved protection of biodiversity and, at the same time, provide an important opportunity for government agencies to become familiar with the procedures and allow time for modifications to be made prior to implementation under law. An overall strengthening of capacity for environmental regulation is also needed. This should occur in all relevant ministries, not just the DoE, and should be based on building knowledge of cost-effective mechanisms for improved environmental performance, not “command and control” regulations.

Strategy: To increase protection of Biodiversity resources from pollution.

Activities:

Activity	Responsibility (Lead Institution and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) Survey of hazardous chemicals used in Eritrea	MLWE	Planned	Needs funding	
(ii) To develop control procedures for hazardous chemicals used in Eritrea	MLWE	Planned	Needs funding	

6.5 *In-situ* conservation (protected areas)

Existing situation: Eritrea does not have a formal protected area system at present. Historical protected areas established under colonial regimes have not been maintained and no longer have any legal status. A number of new sites have been prioritised for increased conservation and management but no legislation exists under which a protected area can be gazetted, except perhaps the Land Proclamation 58/1994³ and the Fisheries Proclamation 104/1998⁴. There is some ambiguity over which ministries have the mandate for creation of protected areas. The responsibility for management of protected areas is also not clearly defined in law.

This lack of legal authority has slowed progress towards establishing protected areas and should be clarified as soon as possible.

In the absence of formal legislation, the MoA has, in collaboration with local communities established over 192,734 ha. of closures. Closures are areas of land, ranging in size from 1 ha. to 40,000 ha. which are “set aside” from human use for an extended period (some are permanent, some are temporary) in order to allow natural regeneration or replanting to occur and for trees to grow beyond grazing height. In places where the rainfall has been normal or better, these closures are showing clear signs of regeneration and improved water infiltration to feed springs which flow for longer into the dry season.

Needs: The legal responsibilities and procedures for gazettment of protected areas must be clarified as soon as possible. This is a major limiting factor to any progress in the creation of protected areas. In the interim, survey work to document biodiversity significance of high priority sites should continue, as can the local consultations required to ensure that increased biodiversity conservation is compatible with other social requirements. In addition to survey of priority sites, knowledge of the conservation needs of particular species should also be improved through “targeted surveys”. The ecological survey work and community consultation undertaken by the MoA on the globally-threatened African Wild Ass (*Equus africanus*) around Ila Isa can serve as a model for this kind of activity. It should be a priority to survey the open uplands around Senafe area in order to establish the current status and conservation management needs of the 13 regional endemic bird species likely to occur in Eritrea⁵.

³ Article 50. Expropriation from Usufructuaries: empowers the government to expropriate land for (amongst other reasons) agricultural development, including all land, forestry and animal conservation projects.

⁴ Article 13: Protected Areas: describes the powers of the Minister to create protected areas and the implications of protected area status.

⁵ This is close to the on-going border conflict with Ethiopia and it is not practical to undertake this kind of survey work at present.

Strategy: Formalization of the process for establishing protected areas system appropriate for the current and future Eritrean conditions by establishing a working group of MoA, MoF and MLWE (and others) to harmonize policy/legislation on protected areas.

Activities:

Activity	Responsibility (Lead Institution and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) The preservation of the flora and fauna through identification, survey and border demarcation of representative protected area(s) in the Central and Northern Highlands	MoA/MLWE/ MoLG	Planned	Needs funding	
(ii) Identification, survey and demarcation of protected areas in Semenawi & Debubawi Bahri	MoA/MLWE/ MoLG	Planned	Needs funding	
(iii) Identification, survey and border demarcation of representative protected area(s) for the Western Lowlands (e.g. North Setit (Tekeze) River: Elephant preserve; Greater Kudu, <i>Tragelaphus strepsiceros</i> ; Duiker, <i>Cephalophus</i> sp.; Warthog, <i>Phacochoeros aethiopicus</i>)	MoA/MLWE/ MoLG	Planned	Needs funding	
(iv) Identification, survey and border demarcation of representative protected area(s) for the Eastern Lowlands (e.g. North Eastern Dankalia (Buri peninsula): Ostrich, <i>Struthio</i> sp; Soemmering's gazelle, <i>Gazella soemmeringii</i> ; Dorcas gazelle, <i>G. dorcas</i> ; Wild ass, <i>Equus equus</i>)	MoA/MLWE/ MoF/ MoLG	Planned	Needs funding	

(v) Identification, survey and border demarcation of representative protected area(s) for the Red Sea Coastal Zone (e.g. Islands proposed for national parks: Sciumma; Black Assarca; Dissej)	MoF/MoA/ ML WE/MoLG	Planned	Needs funding	
(vi) Improved biodiversity benefits associated with closure programmes by formalization of selection criteria for closures; increased monitoring of established closures; establishment of new closures	MoA/MLWE/ MoLG	On-going	Needs additional funding	
(vii) Increased documentation of trans-boundary species in Eritrea and increased collaboration with appropriate international agencies through exchange of information on migratory species between relevant in-country and international organizations	MoA/MLWE/ MoLG	Planned	Needs funding	

6.6 *Ex-situ* conservation

Existing situation: There are no *ex-situ* facilities for terrestrial or marine plant or animal wildlife in Eritrea. There is no botanical garden, no herbarium, no aquarium facilities and no natural history museum. The “Zoo” at Asmara is very poorly maintained. The conditions under which animals are kept are well below acceptable levels and the mislabelling and lack of information means that the establishment serves no useful biodiversity education role.

Needs: Although there are no terrestrial species in Eritrea which are known to be in need of *ex-situ* conservation (within Eritrea) in order to conserve the species from global extinction, some poorly-known species may need *ex-situ* conservation. However, lack of information about distribution and status prevents informed decision-making. There is a growing need for *ex-situ* conservation of some locally-threatened species, especially plants and fish. A national botanical garden and a national aquarium could fulfil both conservation and an educational role simultaneously. The “Zoo” should either be extensively improved to also fulfil this role or should be closed down.

Strategy: To increase biodiversity benefits arising from *ex-situ* conservation facilities.

Activities:

Activity	Responsibility (Lead Institution and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) Preparation of a feasibility study for the establishment of Zoological and Botanic Gardens; Natural History Museum; Aquarium	MoA/MLWE/ UoA	Planned	Needs funding	

6.7 Taxonomic knowledge

Existing situation: The level of modern scientific taxonomic knowledge about biodiversity in Eritrea is very weak. There are no comprehensive reference collections for any major taxon, although small collections are maintained in some sections of the MoA. There are few up-to-date checklists for animals or plants; the existing lists have been compiled in the National Biodiversity Stocktaking Assessment and are slowly being updated by MoA, plus visiting experts. There are few identification keys, field guidebooks and binoculars available to assist staff to conduct surveys in the field. The absence of these “cornerstones” of practical biodiversity documentation represent a major limiting factor on effective biodiversity management. For example, the CAAS of the University of Asmara has plans to conduct biodiversity inventories for the entire country but will not be able to do this unless they can collect, identify preserve and curate specimens.

Strategy: To increase biodiversity benefits arising from improved taxonomic knowledge.

Activities:

Activity	Responsibility (Lead institution and collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) Establish herbarium and zoological collections. Undertake training activities to improve capacities of taxonomic knowledge of relevant institutions	MoA/MLWE/ UoA	Planned	Needs funding	
(ii) Conduct inventories on all aspects of (terrestrial) biodiversity	MoA/MLWE/ UoA /MoLG	Planned	Needs funding	
(iii) Increased participation in regional taxonomic networks (e.g. BIO-NET/EAFRINET, ICIPE)	MoA/ UoA / MLWE	Planned	Needs funding	

6.8 Information acquisition and storage

Existing situation: Although there is a growing amount of environmental information being compiled in Eritrea, there is no centralised repository for this information and gaining access to data can be a difficult, time-consuming process. There is less biodiversity information being collected and stored, because of the critical shortage of appropriate skills in field inventory, survey and monitoring.

The FWD of the MoA maintains records of mammals and birds encountered during field surveys but is unable to identify many species without specialised equipment and more training. The FWD also maintain records of tree species from their surveys. Several overseas researchers and visiting experts are also contributing to these checklists.

Needs: There is a clear need to:

- improve the organisation and accessibility of existing “in-country” biodiversity information;
- identify and acquire as much historical and “out-of-country” information as possible;
- establish and make available a set of standardised biodiversity indicators and survey methods which can be used in all surveys to make data more cross-comparable; and
- improve data exchange between those ministries with potential negative impacts on biodiversity and those responsible for biodiversity management.

Strategy: **To increase biodiversity benefits arising from improved use of biodiversity information.**

Activities:

Activity	Responsibility (Lead Institution and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) Compilation of baseline data surveys, using GIS tools on important habitats, species and resource uses.	MoA/MLWE/ UoA	Planned	Needs funding	
(ii) Participate actively in the acquisition and exchange of biodiversity information with relevant organizations (such as BIO-NET/EAFRINET, ICIPE).	MLWE/MoA/ UoA	Planned	Needs funding	
(iii) Periodical preparation of biodiversity state of environment reports (3-4 years).	MLWE	Planned	Needs funding	

6.9 Public awareness and education

Existing situation: The Ministries of Information and Education are responsible for the broadcasting and dissemination of environmental information in Eritrea, but neither have direct access to good sources of environmental information. The National Union of Eritrean Women (NUEW) and the National Union of Eritrean Youth and Students (NUEYS) are also potentially powerful mechanisms for disseminating environmental information, which the Department of Environment need to establish strong linkages with these organisations.

The available media for spreading biodiversity information (newsprint, radio and TV) are developing rapidly and their capacity to use information exceeds the supply of quality information, especially on biodiversity, rather than general environmental information. To date, dissemination of information on biodiversity has been opportunistic rather than planned and has focused on problems, rather than solutions. The lack of a centralised environmental information database and lack of attention to this issue, limits producing better organised, higher-quality sets of biodiversity-related information.

The school curriculum is under major review and re-development. To date, there has been no formal review and modification of the environmental information content of the curriculum. There are now plans to integrate environmental education into the school curriculum, and to that effect the Department of Environment has already drafted a paper, to be presented to a national workshop expected to be organised by the Ministry of Education. The University of Asmara has begun to incorporate (since 1997) environmental modules in its biology undergraduate programme. The modules have proved popular but a shortage of equipment and specialist teaching skills limits what can be achieved.

Strategy: To improve documentation and dissemination of information on the conservation and sustainable use of biodiversity resources.

Activities:

Activity	Responsibility (Lead Institution and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) Integration of environmental education in general and biodiversity in particular in the national educational system.	MLWE/MoA/MoE/UoA	Planned	Needs funding	
(ii) Increased use of the media to disseminate and promote conservation and use of biodiversity resources	MoI/MLWE	On-going	Needs additional funding	
(iii) Use of relevant government institutions and NGOs in the dissemination of information for the conservation and sustainable use of biodiversity resources.	MLWE/MoA/NUEW/NUEYS/UoA	Planned	Needs funding	
(iv) Preparation of newsletters, audiovisuals, etc., to promote the conservation and sustainable use of biodiversity resources.	MLWE	On-going	Needs additional funding	GoE

6.10 Legal and institutional structure (capacity-building)

6.10.1 Legislation

Existing Situation: The legislation of Eritrea is being re-established “from scratch”. All existing colonial and Ethiopian legislation is effectively degazetted, although some may still be used for practical guidance. New legislation, in the form of Proclamations and Legal Notices (Regulations/Directives) is being prepared by individual ministries or departments in order to establish their mandate and operational scope. Draft legislation must be approved by the Ministry of Justice before being published in the Legal Gazette. There is much overlap of responsibilities for environmental issues across the existing legislation, in spite of the absence of an Environment Proclamation.

Needs: It is imperative that the Environment Proclamation be completed as soon as possible. It is inevitable that this will overlap with existing legislation and special care will need to be taken to ensure that overlapping articles are in harmony and complementary, not contradictory. Also, the draft Forestry and Wildlife Proclamation

should be completed as soon as possible. It is strongly recommended that these two pieces of legislation are completed by a common working group. Future revisions of existing legislation would benefit from the inclusion of statement which mention biodiversity as a specific component of the broader environment.

6.10.2 Institutions (capacity-building):

Existing situation: Human resource development is a priority of the government national development programme. The need for increased training, work experience and technical advisory support is clear in almost every section of government and society; biodiversity-related activities are no exception. This demonstrates that there is a shortage of qualified biologists, ecologists and environmental scientists within all of these institutions. Building capacity whilst at the same time maintaining day-to-day functions in these institutions is a difficult challenge. The shift towards decentralisation of practical government to the regional administrations will make this shortage of expertise even more apparent. Decentralisation means that more and more decisions which affect biodiversity will be taken at regional and sub-regional level but environmental staff in the regional administrations are either lacking or are recently employed graduates with little theoretical or practical experience. They will need strong support from the line ministries if they are to fulfil their duties effectively.

With regard to terrestrial biodiversity, by far the most important institution is the Ministry of Agriculture. It is the government institution with the largest impact on land use throughout the country, through both farming and livestock activities. The MoA is also "home" for the FWD, which is responsible for many biodiversity conservation and sustainable use activities. The Ministry of Land, Water and Environment has responsibility for land classification decisions (Land Department) and for general environmental management (Department of Environment) which overlap, to some extent, with those of the FWD. The University of Asmara has the potential to play an important role in training biodiversity professionals and increasing biodiversity information through the research programme of the Department of Biology and College of Agricultural and Aquatic Sciences (CAAS).

Strategy: To increase representation of biodiversity issues in relevant sectoral legislation, and increased institutional and technical capacity to promote conservation and sustainable use of terrestrial biodiversity.

Activities:

Activity	Responsibility (Lead Institution and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) Capacity building of institutional resources to meet the need of decentralization policy of the government	MoLG/MLWE/ MoA/MoJ	Planned	Needs funding	
(ii) Completion of Environmental Proclamation; provision of biodiversity information to other sectors preparing legislation; regulations; guidelines	MLWE/MoJ	On-going	Needs additional funding	
(iii) Preparation of regulations for managing and administering Protected Area System (National Parks, Nature Reserve, etc.)	MLWE/MoA/ MoLG	Planned	Needs funding	
(iv) Drafting of Biodiversity Legislation	MLWE/MoJ	Planned	Needs funding	

SECTION 7

BIODIVERSITY-RELATED ACTIVITIES FOR MARINE BIODIVERSITY

The marine biodiversity of Eritrea has come through the past years of liberation struggle relatively intact. As a result, the Eritrean Red Sea area remains relatively pristine, due to the lack of pressure from fishing, tourism or coastal and offshore industrial development. The coastal plains, which represent about 60% of Eritrea's total land area, are thinly populated with about 100,000 people scattered predominantly in the main urban areas of Assab and Massawa and to a lesser extent in scattered villages along the coast. With the exception of Massawa and adjacent areas, these areas were relatively unaffected by fighting during the struggle for independence.

Within the next few years, this historical condition of low human impact is set to change rapidly. The Government of Eritrea has identified the use of the marine resources of the Red Sea as an area of major economic expansion, including increased fishing effort, tourism and exploration of oil and gas reserves. Associated with this will be an increase in urbanization of coastal-dwelling communities (both in terms of intrinsic growth and immigration) and increases in economic activities.

The Government is committed to take care of the environment and the sustainable use of natural resources, including coastal, marine and island (CMI) environments. The recently implemented GOE/GEF-funded "Conservation Management of Eritrea's CMI Biodiversity Project" reflects this national commitment. A "Coordination, Planning and Implementation Committee" (*CMI Committee*) has been established with representation from MoF, MLWE, MoA, MOLG, UoA, GEF Project Team, UNDP, MICMEC, plus other co-opted national agencies where necessary (e.g. MTC, MoT, etc.).

The main activities relating to CMI biodiversity are described in the following subsections, according to the framework used for Terrestrial and Agricultural Biodiversity within the NBSAP, in order to identify synergies, duplications and gaps or potential conflicts with activities identified within these other national biodiversity sectors.

7.1 Integrated management

Existing situation: CMI management is not fully integrated at present. The area involved is large, comprising approximately 60,000 km² of coastal plains, over 350 islands and the territorial waters of Eritrea. Integrated environmental management at this scale therefore represents a major administrative and financial challenge to a small and developing nation such as Eritrea. Existing national capacity for CMI management is limited and the problem is compounded by poor transport and communication infrastructure within the area.

Effective CMI management in Eritrea will rely primarily on developing an integrated participatory process for coordination and decision making in order to avoid adverse anthropogenic impacts and prevent further degradation to CMI biodiversity in urbanized areas and zones of exploitation. Due consideration must be given to potential conflicts of interest that may arise within government agencies mandated to both exploit and protect CMI biodiversity.

Strategy: Develop a comprehensive, integrated and participatory management framework for the conservation management and sustainable development of Eritrea's coastal, marine and island biodiversity.

Activities:

Activity	Responsibility (Lead Institution and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
Implement and strengthen the existing GEF/GOE CMI Biodiversity Project "Coordination, Planning and Implementation Committee" (CMI Committee)	MoF/MLWE/ MoA/MoLG/UoA /GEF Project Team, UNDP/MTC/ MICMEC/ plus other co-opted national agencies.	Ongoing	Funds available	GEF/GoE

7.2 Sustainable use of natural resources

Existing situation: Current levels of CMI resource utilization in the Eritrean Red Sea are believed to be well below sustainable utilization due to the slow rebuilding of commercial sectors (e.g. tourism, fisheries, etc.) following independence. However, because of limited information available regarding CMI resources (including baseline data on biodiversity and commercial fish stocks), an accurate assessment of the economic potential of these resources is not available.

CMI resources are limited and must therefore be carefully assessed and monitored and exploitation carefully controlled. For example, whilst the recently promulgated Fisheries Legislation will help ensure the sustainable use of fisheries resources, it will only be effective if a baseline is established and compliance is monitored and enforced. Thus, an integrated CMI Development and Zoning Plan should be developed which sets standards which all sectors should comply with.

Strategy: Formulate an integrated CMI Development and Zoning Plan.

Activities:

Activity	Responsibility (Lead Institutions and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) Establish a baseline of CMI biodiversity and initiate monitoring programs.	MoF/MLWE/MoA/ MoLG/UoA/MoT.	Planned	Funds available	GoE/GEF
(ii) Undertake sector-specific/cross-sectoral analyses of the impacts and management implications of key development activities on CMI biodiversity.	MoF/MLWE/MoA/ MoLG/UoA/MoT/ MTC.	Planned	Funds available	GoE/GEF
(iii) Formulate an integrated CMI Development and Zoning Plan, incorporating CMI-specific EIA guidelines.	MoF/MLWE/MoA/ MoLG/UoA/MoT/ MTC/MTI	Planned	Funds available	GoE/GEF

7.3 Alien invasive species

Existing situation: The Eritrean Red Sea territorial waters are part of a major shipping route between the Mediterranean Sea and the Indian Ocean, with many hundreds of ships passing every year. The potential for the accidental introduction of alien invasive marine species is therefore high, especially through bilge discharge. Similarly, increasing numbers of alien species are being introduced by coastal development projects without due regard to issues of environmental testing and impacts, monitoring or containment security, reflecting a conflict of interest between development and conservation at the Ministerial level.

The Indian House Crow (*Corvus splendens*) now dominates the urban area of Massawa following its recent introduction and is now spreading inland. Some introduced plants, such as *Prosopis chiliensis*, are also spreading following introduction to Massawa. The impacts of the recent introduction of at least seven exotic species at the new aquaculture venture in Massawa remains unknown but poses a potentially serious threat to CMI biodiversity, particularly with the introduction of potentially competitive marine and halophytic species such as tilapia, *Peaenus sp.*, *Salicornia sp.* and *Rhizophora sp.*

Strategy: Protection of the coastal, marine and island environment from alien invasive species.

Activities:

Activity	Responsibility (Lead Institutions and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) Establish a database of known CMI invasive species.	MoF/MLWE/MoA/ MoLG/UoA.	Planned	Funds available	GoE/GEF
(ii) Establish policies for safeguarding against alien invasive species, including licensing, screening, monitoring and containment procedures.	MoF/MLWE/MoA/ MoLG/UoA/MoT/ MTC.	Planned	Funds available	GoE/GEF
(iii) Establish an eradication and containment programme for known and potentially harmful alien invasive species.	MoF/MLWE/MoA/ MoLG/UoA/MoT.	Planned	Funds available	GoE/GEF

7.4 Pollution management

Existing situation: The CMI environment is potentially threatened by pollution from a variety of sources, including: marine shipping (especially oil tankers); oil and gas exploration; urban and industrial waste; and industrial developments. At present, almost all industrial activity in the CMI areas is concentrated in the ports of Massawa and Assab and includes cement and salt manufacture, shipping and power generation. These urban areas lack proper sewage and solid waste management facilities. The Government plans to develop a number of key sectors, all of which will require proper EIA compliance and pollution mitigation, management and control, in order to avoid serious adverse impacts to CMI biodiversity.

Strategy: Identify, monitor and control potential sources of pollution within CMI areas.

Activities:

Activity	Responsibility (Lead Institution and Collaborators)	Priority Ongoing or Planned	Funding and Other Needs	Funding Agency
(i) Monitoring of critical pollutants which impact on marine and coastal environment.	DoE (MLWE)	Ongoing	Funds available	GoE
(ii) Install and maintain reception facilities for Crude Oil Wash (COW) at Massawa & Assab	MTC	Planned	Needs funding	
(iii) Establish and implement Oil Pollution Contingency Plan	MTC/MEM	Planned	Needs funding	
(iv) Install receptacles at all fishing centers in which fishermen can dispose of used engine oil.	MoF	Planned	Needs funding	
(v) Issue a norm for the construction of septic tanks for all present and future coastal buildings.	MoLG/MLWE/ Zoba administration	Planned	Needs funding	

7.5 In-situ conservation (i.e. protected areas)

Existing situation: *In-situ* conservation is an affective way of protecting biodiversity, providing for: protection of endangered species; maintenance and/or restoration of viable populations of native species, communities, habitats, breeding areas and genetic diversity; protection of breeding and feeding areas for migratory species; and provision of space to allow species migrations in response to environmental change.

There are currently no formal protected areas within the CMI zones of Eritrea, although a number of potential sites have been identified, including: Dur Gaam and Dur Gella islands; the Fatuma and Museri island groups; and the Buri Peninsula. In the coastal region, the area around Ila Isa has been prioritized for increased protection for the