

UNEP - UNIT FOR REGIONAL COORDINATION FOR EAST
AFRICAN REGION

REPORT ON THE STATE OF MANAGEMENT OF PROTECTED
MARINE AREAS IN COMOROS

APRIL 2000-07-19

MRS. ALI ABODALLAH FATOUMA
MRS. ALI BICARIMA
MR. SAID AHAMADA

GENERAL

The Federal Islamic Republic of Comoros is made up to three islands situated between south latitude $11^{\circ} 20'$ and $11^{\circ} 4'$ and longitude $43^{\circ} 11'$ and $49^{\circ} 19'$ East (North of Mozambican channel, between Madagascar and the African continent). Great Comoro in North west is the largest with a surface area of 1.011 km^2 . It is situated at 300 km from the Mozambican coast. Anjouan is the more oriental with a surface area of 424 km^2 - Moheli is the more residential and the smallest with a surface area of 211 km^2 .

Climate

The Climatic conditions are of tropical type, with the influence of month -month week monsoon "Kashkasi" which brings heavy rain falls from November to April, period corresponding to a hot and humid season, and the trade winds from South "Kussi" and South-East "Matulay" from May to October corresponding to a dry and cool season.

The average annual temperature is between 23°C and 28°C , with important fluctuations in the thermal gradients of humidity and pluviometry, in relation altitude, relief and declivity considered.

The average rain fall can vary from 600 to 700 mm, in function of altitudes and exposure of the sides of the winds, the western sides are generally the more soaked.

Geology

The Comoros have to be considered as the emerged parts of big volcanoes, that have set on the sea bed of the Mozambican channel. Their geological history starts from the end to the tertiary era.

The islands have not been formed at the same time, but there has been a migration of volcanoes, from South-East to North-West, during the geological period. Moheli island is the oldest formation estimated to 3.4 and 1.4 millions years, and for Anjouan between 1.5 and 0.4 millions years, and for Great Comoro, between 130 000 and 10 000 years. Perversely, the altitude increased from North- West to South-East.

The "Karthala, higher to 236m is characterised by a vast "caldeira" of 3 to 4 km in diameter, is the only active volcano in Great Comoro.

The rocky Coasts are generally low, except two volcanic cones on the abrupt declivities south of Moroni.

The sub-marine slope of the archipelago is very strong, with a continental plate of up to 200 m in depth on average. This plate is very narrow between 200m and 1200m in width.

Some characteristics of the population

The Comoros, an Islamic country with "promotalist" tendency, has very high fertility rate.

- 5.9 children/woman in N'gazidya
- 7.1 children/woman in Moheli
- 8.3 children/woman in Anjouan
- 5.4 children/ woman in Urban area
- 7.4 children/ woman in Rural area

A high density: 240 inhabitants/Km² on average, with 84 inhabitants/km² in Moheli, 204 inhabitants/km² in Great Comoro and 446 inhabitants/km² in Anjouan.

Evolution of the population (1980-2000)

YEAR	RFIC	NGAZIDJA	NDZOUANI	MWALI
1980	335 150	182 656	135 958	16 536
1981	344 027	186 782	140 088	17 157
1982	335 140	191 001	144 343	17 796
1983	362 493	195 316	148 727	18 450
1984	372 095	199 728	153 245	19 122
1985	381 950	204 240	157 900	19 810
1986	392 062	208 853	162 696	20 513
1987	402 453	213 571	172 730	21 987
1989	424 055	233 374	117 977	22 749
1990	435 287	228 374	183 383	25 530
1991	446 817	233 533	188 953	24 331
1992	458 648	238 808	194 692	25 148
1993	470 793	244 203	200 606	25 984
1984	483 260	249 719	206 700	26 841
1985	496 057	255 360	212 978	27 719
1986	509 192	261 129	219 448	28 615
1987	522 940	268 179	225 373	29 388
1998	537 059	275 420	231 458	30 181
1999	551 559	282 856	237 707	30 996
2000	566 451	290 493	244 125	31 833

Sources" From 1980 to 1996 population estimate of UNDP << Développement Durable et Elimination de la Pauvreté>> Frison - Roche, 1997. From 1997 to 2000: estimate realised by ourselves, using the official rate de growth of 2.7.

A. Introduction

The coral reefs of the Federal Republic of Comoro were not well known. Since the establishment of the Regional Environmental Programme, coherent observations have been realized on the reefs state of health.

The coral reefs of Comoros are principally of fringing type, with various littoral extensions around each island. They cover approximately 60% of littoral from Grand Comoro 80% for Anjouan and nearly 100% for Moheli. The total surface area of the plates around the three islands is estimated to nearly 1100 hectares.

The ecosystems constitute a shelter, and a food for a large variety of marine animals (the most common are:

The touristic attraction of the reefs of Comoro islands is evident by its extraordinary wealth in colour and in forms of its habitat and the numerous faunistic species of particular ethology.

Meanwhile the corals reefs are endangered. Main's action is perhaps considered as its principal menace, notably due to dynamite fishing, DG, <<Uruva>>, to Tephosia, and to very small knots netting, to terrestrials and marine pollution, to coral extraction, and to the management of the coasts. These destructive elements provoke a decrease in the productivity, the riches and the diversity of the species.

Marine Fauna

The Coastal and marine fauna of Comoro is rich and contains important world-wide elements. Nevertheless, there exist a gap in the knowledge of that same riches.

The species associated to the coral reefs are very numerous (fishes, shell fishes, molluscs etc ...) but they have not been studied systematically. As per estimates, there are in Comoros nearly 820 species of marine fishes (coastal and pelagic all together).

Marine flora

The marine flora of herbariums is interesting, also ecologically important because it is used as support to fix numerous organisms (seaweeds, hydrarians, bryozoa, ascidians), as a refuge for many marine species such as gastropods, as food for the herbivorous marine species such as sea-cow, and the green turtles. This habitat is also ecologically important as a stabilizer for the dynamism of the coasts in consolidating the sediments and in constituting a natural barrier against the storms and marine erosion.

The surface area occupied by the herbariums seems to be reduced to Great Comoro, but appears to be more important in Anjouan, in particular.

The most frequent species of phanerogramous observed in the Comorian Coast are: Gracillaria, Janica, Lithokammium, Padina, Ulra, Codium, Halimeda, Halodule, Halophylla, Porolithon, Thalassia, Zastera, Syringodium, Cymodocep, C. Ciliata, and also the brown sea-weed: Turbinaria, Sargassum. It could be found in the zone, many sea-weeds, of which some are filamentous (Isma, 1986, Farghaly, 1980). To date, they have practically disappeared.

Endangered species

In this part, we are interested in species which are in danger, which are concerned by the project of conservation, namely the Coelacanth and the turtle.

Turtles

Four species frequent the Comoros waters: the green turtle (*Chelonia mydas*), scaly turtle (*Enetmochelys imbricata*), the logger-head (large sea turtle) (*Careta, careta*) and the lute turtle (*Dharmochelys coriacea*). The green turtle and the scaly turtle are the only one to nidify on the sandy beaches are the endangered species.

To date the scaly turtle has practically disappeared from the beaches in Comoros. This due no doubt to the fact that its daily nest-building exposes it more to its predators. The green marine turtle, contrary, is very frequent on the breeding places of the islands (specially in Moheli). The period in which reproduction for the green turtle is at its highest is situated around the month of May, when the period of between November and March is the highest for the imbricated turtle.

Anjouan whereby many beaches are left destitute and where the predators of the species are not numerous among all the islands of the archipelago, does not offer the breeding sites.

The sites that show some traces of breeding shall be Bimbini, Moya, Miriotsi. But the traces in question appear to be more the results of the poaching that has been carried out on certain sites of Mwali. In Ngazidja, the turtles are observed in the coastal waters of the island. But there are only the beaches of Male, Mbashile and Iwani that present relatively rare traces of breeding.

Moheli is one of the islands in the occidental Indian Ocean where the turtles are the most abundant. On 89 beaches, around 40% present

an evidence of breeding. The most popular sites are situated principally in the East (Itsamia), south coast (Nyumashiura island). These regions of the island form part of the parc, which is being realised by the GEF biodiversity project.

The breeding sites of turtles, as well as the species themselves are endangered by the increasing human activity (removal of materials, notably the sand for construction) and the poaching by certain category of the population (specially people from Anjouan) which kill the turtles for the flesh, the eggs, the oil, the shell, but also by the presence of the crabs and birds (fregates, grey herons crows) the civet – cat and the dogs which feed on their eggs and also on the little new borns.

The capture of turtles as well as their commercialisation are prohibited by the Comorian law (Presidential decree No 79-012 of 9th April 1979 and Interdepartmental order No 92-015 of 30th March 1992).

In Moheli, the protection of this specie is controlled by the villagers associations (Ulanga of Itsamia, of Nyumashiwa and Hoami) and some rare members of the department of environment that are present on the Island.

The observation and information units have been set up in Itsamia (Turtles House) and Hoani (small information center) in view of sensitizing the population on the necessity of preserving the specie. Even so, that the green turtle and the scaly turtle are species which are being menaced by extinction. We hope that the establishment of the park will limit the poaching.

Coelacanth

The Coelacanth (*Latiimeria Chalumnae*) is an endemic fossil fish living since the prehistoric years where their origins go back to approximately 370 million years. Its discovery in the waters of the Comorian territory in 1938 is one of the next extraordinary discovery of the century. Its presence is one of the key elements in the biodiversity of the region.

In spite that the area of distribution was cosmopolitan, the actual area is reduced to the west coasts of Ngazidja. The habitat of coelacanth constitutes of deep sub-marine caves (between 170m and 230m) of coastal waters Ngazidja, along the coasts of Salimani, in Sima Mbwani, having Itsundzu as central zone. The coasts zones, where the captures have been reported. The population of coelacanths at Ngazidja is actually estimated to 200 individuals, against 200 to 230 individuals estimated in 1991. The capture of coelacanth happens

accidentally, but the local fisherman are encouraged by bid incentives from research institutions, international museums and private collectors.

The deduction of coelacanth is practiced in an informal and clandestine way since its is prohibited by the law (law on environment, Federal Assembly, June 1994 – Inter ministerial degree Bo 74-029/PR?MID of 12th January 1974 related to the capture, transfer and detention of coelacanth).

On the South West coast of Ngazidja, it is foreseen the setting up of a scientific research pole, of a welcome center and a marine reserve of coelacanths (national observatory of Coelacanths and marine life), all in integrated way.

The international scientists of Toba aquarium of Japan, JLB Smith institute of South Africa, Max-Planck institute of Germany and the oceanology centre of Marseille (France) are carrying out a census on the population of coelacanths, the marking, and the measuring of environmental parameters. These Scientific data are sent regularly to the “CNDRS” but they have been yet exploited at national level.

B. Integrated management of the Coastal Zone

Being on island, the coastal zone of Comoros suffers numerous degradation whereby the majority is due to the action of man. Because of economic problems, of this country, the coastal populations exploit irrationally the nature resources. The destructive activities carried on the coasts are of various types, namely the fishing technics which destroy the coastal materials, which not only contribute of the erosion of the coast, but also prevent the of receiving tourism potential, because of the disappearances of the beaches.

Conscious of this problem, the government is making of a national management of environment and the coastal zone in particular, one of its priorities. This political goodwill is translated into a national environmental action of plan (PAE). Many projects have been put to use in order to help the country to implement its policy of management of environment.

The regional environmental programme is one of the first biggest projects to be done. This project of which the principal objectives is the integrated management of the coastal zone has realized many projects in view of protecting the coastal zone. The socio-economic and ecological situation of the coastal zone has been established the pilot actions whereby the principal objectives to experiment the

feasibility of a policy of the integrated management of the coastal zone at local level. A plan of action for the management of the reefs and the marine ecotoxicology has been elaborated. The national networks for the monitoring of the reefs and the marine ecotoxicolog phemonemon have been set up. This programme has equally helped the country in the training of its nationals in the field of environment and in the setting up of information system and support for decision.

The biodiversity conservation project under the GEF funding has just been launched. The main objective is the strengthening of the components of the biodiversity, the national policy for environment and of the plan of action for environment. The main achievements of this project could be creation of national pilot park under an agreement of joint management.

1. The Communities participation

The local community forms an integral part of the management of the coastal zone. Thanks to the sensitization actions carried out by the general direction of environment, with the support of environmental projects, the local populations start being conscious of the necessity of protecting the environment in general. Many associations for protection of environment have been set up in different localities, and they work towards a better management of natural resources. The actual environment management policy developed in different localities is directly managed by the beneficiaries themselves namely the community at lower level.

As example the regional environment programme has initiated the pilot operations on three sites of the island. These management projects of the coastal zone are managed by the local community, which for a better organization has et up the piloting structures of representatives of social structures of the town or village where the projects are developed.

2. Partnership with the private sector

The sector is considered as a privileged partner in the integrated management of the coastal zone. The hotel infrastructures are involved in the process of concertation and application measures of protection of the coastal zone. At level of operation "Coastal development of Mitsamiouli the Galawa Beach hotel participate in the management of coastal fishing, in watching over, for example the non-utilisation of destructive fishing practices of the marine environment.

3. Promising approaches of the management of the Coastal Zone

One of the achievements of the implementation of the GIZC policy in Comoros in the establishment of effective partnership between the different actors intervening in the coastal zone. The partners are essentially the community, the association for protection of the environment, the general direction of the environment as well the sponsors, financing the project of management of the coastal zone. The private sector equally plays an important role in the setting up of this policy.

Moreover, the setting up in the near future of the unit for durable development (UDD) will constitute a stage of consolidation of the policy of the integrated management in member states of the Indian Ocean Commission.

C. PROTECTED MARINE AREAS AND GIZC SITES

C1: Protected marine areas

Actually two protected marine areas have been identified.

1. The regional marine park for the Coelacanth

The regional marine park for the Coelacanth is arranged in a zone of 25 to 30 km of the Coastal line, located in the south west of the Great Comoro (see map).

GREAT COMORO ISLAND
SITUATION OF PROPOSED PROTECTED AREA

MAP 1: Map of situation of the proposed zone for the implementation of
coelacanth park

The objectives of the park are:

- The protection of the population of Coelacanth and its marine biotope.
- Integrated management of coast activities (fishing and extraction of materials)
- Touristic valorization (landscape enhancement, Coelacanth myth, information and discovery center)
- Scientific research on Coelacanth and its habitat.

A programme for the setting up of the park for the Coelacanth, including a management plan has been proposed in the study file of pre-feasibility, which is to be validated during May 2000. The organization which seems more appropriate to administer and manage the Coelacanth park should be an association Coelacanth park whereby the administration council will constitute of:

- A director for Coelacanth house
- 2 representatives of non-scientific personnel of the park
- 2 representatives of non – scientific personnel of the park
- 1 representative of the National Centre for documentation and Scientific research
- 1 representative of the general direction for environment
- 1 representative of the association for the preservation of Gomblessa (Coelacanth)
- 1 representative of the international foundation for Coelacanth
- 1 representative of inter-villagers committee.

The validation of the study proposals could facilitate the demands for funding.

The main objectives of the park being the protection of Coelacanth and its biotope, the cessation of the capture of coelacanth is considered as an important indicator of success.

The aims of the integrated management of the zone are:

- the re-absorption on significant reduction of sand extraction
- the participative wastes management.

A starting zero point could be established on the two themes through cartography and socio-economical study. This would allow the follow-up of the evolution of the situation.

The efficiency of a good governorship will be evaluated by the absence of durable conflicts within the part.

Impacts, Conflicts and pressures

The plan of utilization of soils elaborated by the German surveying bureau (AGRAR, 1987), based on a cartography of the occupation of soils, does not take into consideration the protected areas (Which were not yet programmed) and vice versa.

The identified primary actors for the management of the park are the villagers communities through the inter-villages committee and the Gomblessa associations, the "CNDRS" the "DGE" and the international community through the international Foundation for Coelacanth.

The potential impacts and factors of pressures on the park are:

- the bottom line fishing, specifically the "maze" fishing whereby the coelacanth is caught accidentally
- the extraction of materials (sand, corals, pebbles) which facilitate coastal erosion
- dynamite fishing which create a reduction of the biodiversity and the ecological unbalance in the coastal and marine zone
- the eventual conflicts.

The narrowness of the plate makes that the fishing of galawas (non engined traditional boats) is concentrated in the coastal zone, where the "demersals" species are becoming thus over exploited.

This leads to the shifting of the fishing effort of the "galawas" near the deep sea where lives the coelacanth population. This constitutes the main cause of the declination of these populations.

The withdrawal of coastal materials for construction purpose endangers not only the coast line, but also the biological structure of the reefs. In fact, the anthropo-erosion and the planetary phenomenon of whitening of corals have disturbing influences which have increasing effects.

The actors of different pressures are in permanent conflicts with the protectors of the environment, who are either from the same village or from the neighbouring village. A presentation system and the management of these conflicts will be set up through a consensus between the villagers, the prominent citizen and the civil authorities of the region. The consensus could be negotiated with the promotion of the compensation measures.

The local community participates actively in the setting up of the park, thus, an association for the preservation of coelacanth called <<Gomblessa>> has been created in 1997. This association has been identified as the primary actor in the management of park and plays a leading role in the success of this project.

The pre-feasibility study of the regional marine park for coelacanth realized in February 2000 advocates 7 helpful approaches for the management of the park:

- a fishing reserve
- the bosphere reserve
- the reserve for world patrimony of humanity
- a park oriented towards conservation – education and research
- a park dedicated to the conservation and the tourism
- a park associating the conservation of coelacanth and the integrated management of the seaboard
- a multi-functions marine park uniting conservation – education, research and tourism.

Following the reunion of validation of the pre-feasibility study of a regional marine park for coelacanth, organised on the 14th May 2000, under the aegis of the Regional Environmental Programme, the assembly is concentrated on a park oriented towards conservation education and research leading to a reserve of biosphere.

2. The marine park of Moheli

Situated on the territory between Miringoni and Itsamia (see map), its surface area is estimated at 40.360 hectates.

The objective of the park is to ensure the conservation and a durable use of marine and coastal biodiversity, specially fisheries resources and the development of eco-tourism activities.

Impacts, conflicts and pressures

The coral reef of the zone of the park is confronted with pressures of the anthropic origin such as:

- The dynamite fishing : this type of fishing which is very destructive the entire ecosystem is practiced occasionally in Nioumachouoi. All the coralline platform of the islets is covered with remains of corals which have recently been broken down, as results of the massive utilization of dynamites.

- The stamping of corals: the fishermen and the women take the opportunity to capture octopus and other fishes when the tide is low, because the reef platform of the islets is not too deep. Therefore the corals have broken and destroyed.
- The pressure of fishing on the islets: all the Comorian fishermen are aware that the islets of Nioumachouoi are the most productive of fishes. The engine boats, all from Moheli, Anjouan and even Great Comoro practice daily fishing in open sea, but also in the coral reef. The pressure of fishing has weakened the ecosystem of the islets. Moreover, the small boats cast their anchors on the corals to access to a good fishing site, thus contributing to the destruction of the corals.
- The global warming of the climate of 1997/1998 has provoked the whitening forms, which are very sensitive to the environmental stress. The white corals are definitively dead and covered with calcareous sea-weeds.
- Most of the isles of Nioumachouoi are confronted with strong waves which contribute a lot to the destruction of corals of Acroporidae species. But this type of destruction is insignificant compared to the anthropic degradation.

As for the marine turtles, poaching is done by the fishermen coming from the other islands and the residents of the newly set up villages by the immigrants of Anjouan.

According to Mortimer (1993) a laying female turtle that is searching for a site to lay her eggs on the beach has 35 to 65% of chance of surviving. Moreover, a degradation of the habitat by the extraction of sand from the beach, the deforestation of the dunes slope, the agricultural activities and the layout (for e.g roads) in coastal areas which have some impacts on the ecological balance of the zone.

Erosion is observed at different places and the sand deposits lead to the suffocation of corals.

The conflicts are thus frequent between poachers and the youth of the association for the protection of environment.

Conflicts also exist between tourism operators who want to appropriate the marine and coastal zones contiguous to their infrastructures (for example hotels). The elaboration of the plan for the management is programmed for the end of the year 2000. The type of organization proposed to assure the management of the park is a management committee which is composed of:

- A chairman who is the general secretary of the administration of Moheli island

- A vice-chairman which is a delegate of the community of the village bordering the park.
- 10 representatives from the villages bordering the park.
- A representative from the regional administration for environment and production (for Moheli region)
- A representative from the regional administration for tourism and transport.
- A representative from armed police
- A representative of the park agents
- A representative of operators in tourism sector



The main objective of the park being the protection of marine turtles and coralline reefs, the signs of success would be then the recovery of turtles population, with the reduction of the poaching and conflicts, as well as the regeneration of corals.

The village communities are considered as the primary actors in the management of the park. In management agreement has been signed between the community and the project responsible for the setting up of the park.

The approach taken for the management of the park is a participative management process resulting in a co-management of natural resources.

C2. GIZC sites: Pilote site of Itsamia.

The pilote site of Itsamia present a particular interest in the sens that is has been object of GIZC pilote operation, and is included in the marine park of Moheli.

The Regional Environmental Programmes of the Indian Ocean Commission financed by the European Union (Pre-COI/UE) has chosen and identified this site for the realization leading to the coastal zone management..

Action Card of PRE-COI UE

Summary

Following the initiative of setting up the village association of Moheli for environment protection aiming at the organisation of seminar of sensitization on the turtles protection, it seems important to support this manifestation. Support the extent of the dangers encountered by this internationally protected fauna, the Environment Project COI/FED proposes to extend the event to a areal

national debate on the integrated management of coastal zones and to take the opportunity of the necessity to set up an infrastructure for the organisation of the seminar. Thus, on this site a permanent center of information on turtles will be created and will support the association in the perspective of scientific follow-up and the protection of turtles, and the management of the site for the eco-tourism.

The Context

The marine turtles (green turtle: *Chelonia mydas*, and imbricated turtle: *Eretmochelys imbricata*) are subject of great hunting on the laying sites. The meat is particularly appreciated by a category of the population and the poaches make nocturnal expeditions very regularly. The turtles are often killed on the beaches, before they even have the time to lay. The beaches which are regularly visited by the turtles are not protected, and the practices of sand exploitation for the construction endanger the sites of essential value for the reproduction of the species.

The Itsamia association (Mtsanga Nyamba), which intervenes in the protection of turtles is one dynamic association in the protection of the environment. It participates like many others in the monitoring of beaches, the supervision of the laying sites and in struggle against the poaches.

The villagers associations for the protection of the environment, animated by the youth, does dispose of very limited resources and the adherents loose their motivation as time goes. The poaching increases to a point that many association resign progressively from their original mission.

2.2 Institutional/sectorial context

The National Organiser

- The Parent Ministries of technical character
- The General Direction of the Environment and decentralised services (Regional Environment Service of Moheli)
- The funds sponsors
- The Governorship of Moheli

The Ministry of Rural Development, the fisheries and the Environment is the designated Guardian for this type of operation. The General Direction of Environment (and the associated environmental projects) is the privileged operator.

The Direction of fisheries is equally concerned, as well as the Ministry of Tourism, by synergy effect.

Two projects centred on the protection of the environment are most principally concerned:

- The Regional project of environment of the environment are most principally concerned: in the context of the coastal management (physical protection of the coast against the erosion and biological protection of the zones of great biodiversity: reefs, mangroves, beaches of the turtles reproduction etc...);
- The project of conservation of the biodiversity UNDP/GEF: protection of sensitive sites, classification and laying out of the Marine Park of Moheli (including the islets of Nioumatchoua and the South coast of the island).

2.3 Problems

The problematic is triple and put into evidence the interactions between environment, fishing and tourism:

- the extraction of sand from beaches destroys the laying sites, the poaching leads to a pillage of the resource.
- Fishing realised actually does not cover the protein needs of the population. The turtle is an easy prey with a high added value.
- The presence of the turtles is the essential interest of the Moheli island for the tourists, but the populations are not conscious of the fact that the laying sites can bring to them substantial revenues through the valorisation of the sites.

The problem is thus not only ecological (risk of extinction of species) but economic: the reduction of the turtles population inevitably leads to a reduction in revenue coming from the poaching and the impossibility to valorise in time the beaches in touristic point of view.

Moreover, in the actual context, the youth associations cannot pursue their action of protection: acute conflicts with poaches, associated to a lack of material, a reduction in credibility locally and an absence of the institutional support.

3. THE INTERVENTION

Looking at the encountered problems, the idea of a seminar/workshop on the protection the of turtles in Comoros has emerged under the initiative of the association of the Itsamia village.

The seminar/workshop has for objective to voice the constraints, the possibilities, the gaps, the conflicts, with the aim of launching an operation of laying out and protection of laying sites in Itsamia, through a pilote action and in the perspective of extending sites in a development phase.

The UNDP and the association of Itsamia have been able to obtain a financial agreement with the Netherland's embassy to support the organisation of the seminar (up to 3000 000 CF), operation which is done in the context of the projects that are being implemented in the setting up of the Marine Park of Moheli.

In the context of the realisation of its environmental audit, the "PRE COI" has met the members of the association and its has been solicited to provide a support to the organisation of this seminar.

In the propose of intensifying the sensitisation action, the "PRE COI" proposes the setting up of a permanent information center for the protection of turtles, aiming at the educational and the eco-touristic aspects, managed by the association. The restored building to that effect will be used to carry the seminar in good conditions, and will used as springboard for the activities of the association (welcoming and permanent exposition center) and will constitute an operational base for the follow up of the turtles protection.

It is equally envisaged to associate to this "House of turtles" (<<Nyumba Nyumba>> in Comorian) three small bungalows in local materials (braided palm) to welcome the visitors.

3.1 Objectives

Global Objectives

THE COSTAL ZONE IS OBJECT OF AN INTEGRATED MODE OF MANAGEMENT

Specific Objective

The laying sites and the populations of marine turtles are managed and protected through the amelioration of knowledge, the reduction of conflicts and the valorisation of the beaches.

3.2 Expected Results

- Seminar/national debate
- Sensitisation/Communication
- Conference and action plan with international expert
- Turtles permanent information center
- Accommodation bungalows made of local materials
- Mechanism of integrated management
- Accompaniment of the OPI N°3 by sensitization campaign.

3.3 Location of the intervention

Itsamia village in Moheli.

The entire Moheli island, in the perspective of setting up of a global consensus around the protection of the marine turtles laying sites, the adherence of fishermen, the touristic valorisation.

The neighbouring islands (Anjouan, Great Comoro and Mayotte) are equally concerned in the sense that the majority of the pressures caused by the poaching is exercised by the fisherman coming from these islands.

4. PRINCIPAL ACTORS AND BENEFICIARIES

The actors:

These responsible for the institution

- National organiser
- Parent Ministries: Ministry of Agriculture, the forestry, the fisheries and the environment
- Ministry of Tourism
- The Technical Directions: General Direction of environment, Direction for fisheries, Direction for Tourism.

The international funds providers organisations

- FED (PRE COI Project and eventually micro-realisation programme)
- UNDP
- Other eventual sponsors: French Cooperation, Foundations and international NGO's for the protection of the nature.

The local villagers association for the development and the protection of environment

- Itsamia Association, on the project initiative
- Other active associations of Moheli (Nioumachoua, Hoani etc, etc...)
- The associations of protection of the nature of Great Comoro and Anjouan (through the invited representatives to the seminar)

The beneficiaries

The local Villages associations for the development and the protection of the environment

- Association of Itsamia, through a methodological support and the provision of equipment
- Other villages associations of Moheli, by impulsion effect

The villages close to the laying sites and the national tourism operators through the increase of the touristic attractions of Moheli and the economic impacts.

The regional service of the environment of Moheli through the revalorisation of its role and its implication in concrete actions.

The General Direction of environment because it complements the funds providers about an environmental action, in the PAE logic.

D. Evaluation of the coral reefs and the associated biodiversity

D1. State of health of the coral reefs and associated biodiversity in the marine park of Moheli

The coral reefs have been diagnosed by submarine explorations, sometimes followed by "transects" carried by Dr Virginie Tilot, and in 1998 and 1999 by AIDE team.

Comparative table of % of living coral during the years (in 93,98,99)

Sectors/Sites	G.P.S Coordinates 1999	Tilot 1993	AIDE 1998	AIDE 1999
OUNEFOU	S12°23'53,6" et E 043°42'34,9"	PL : 31%	PI : 20 %	PL : 5%
				PE : 20%
Mea		PL : 45%	PL : 35%	PL : 10%
Itsamia	S 12°22'22,2" E 43°55'08,2"	PL : 73%	PL : 35%	PL : 30%
				PE : 53.5%
Fomboni	S12°16'18,02" et E 043°44'26,2"	PL : 8%	PL : 10%	PL : 5%
				PE : 23.5%
Candzoni	S12°24'21"7 E 043°39'53"7			PL : 21.7%
				PE : 39%
Wallah 1	S12°19'24" E 043°38'57,9"			PL : 40% PE : 51.2%

Source: AIDE, 1999

The comparative analysis of the percentage of recovery of living coral during the years shows a regressive evolution in the health of corals reefs, in the explored area.

The regression in the recovery of the living coral from 1993 to 1998 can be explained by the pressures applied on the reefs (dynamite fishing, brutal anchorage of boats, the stamping by outboard fishing during low tides, and the dumping of wastes), emphasized by the global whitening phenomenon in 1998/1999. A regeneration in the form of bulky reef starts to manifest but seems to be slow where the human pressures are intense.

The Moheli island is considered as the only one to possess the most important laying sites for the turtles (*Chelonia mydas* and *Eretmochelys imbricata*) in the South west region of Indian Ocean. The most important west building sites of turtles of the island have been mentioned in numerous documents (Mortimer 93, Jamar 93; Tilot 94, Ahamada 1999). It consists of beaches of Itsamia (Mtanganyamba, Nyangoni 1, Nyangoni 2, Bwelamanga and Itsamia beach), the beaches of Hamba and beaches of the islets of Ouenefou, Mea and Canzoni (Nioumachoua). According to Frazier, 1800 green turtles might have come to lay their eggs on Moheli beaches, while Mortimer in 1993 mentions 1235 individuals. Actually a permanent follow up of the layings is being undertaken by the GEF project <<conservation of biodiversity and durable development>>.

The latest estimations of the biodiversity project (2000) reported for the year 1999 approximately 6000 midifying females per year on the island, of which 3000 are for the zone of Itsamia. This allows the island to be placed in the third position after Rain Island in Australia and Europe in the Indian Ocean.

However the exploitation of turtles has increased from 13% (1972/73) of the midifying population to 35% in 1994. This implies a decrease in the green turtles population, because the females are often captured before the laying period.

The mangroves are not very well developed in Comoros. They cover 91 hectares of the surface area of Moheli. The sites of the south coasts of the island are not exposed to the winds of "Kashkaze", "Mbeni" and "Matulay". The coast of this part of the island is equally protected against the wind of Kussi by the islets of Nioumachoua, and its dented structure. The island is then experiencing considerable development of the mangroves forests of characteristics species of *Rhizophora*, *micromata*, *Avicennia marina*, *Bruguerra gymnorgiza*, *Lumnitzera racemosa*. The sites of Damou and Mapiochingo near Nioumachoua are the richest. The mangroves of Nioumachoua and Moihani have been exploited in a way which could have a negative impacts such as erosion of the coasts. Despite the one tenth diminution of mangroves in Chissioi bwelamanga sector, the general tendency is to the expansion (Tilot 1993). According to many evidences and observations, the marine herbariums seem to be in decline (see types of habitats under point 4.1).

D.2 States of the biodiversity in the Coelacanth park

The population of the biodiversity in the Coelacanth park of the Great Comoro is actually estimated at 200 to 300 individuals (Plante et al. 2000).

And yet since 1938, more than 200 coelacanths have been fished (Le Berre 1993). Actually 1 to 11 are caught per year. That is an average 4.39 specimens per year since 1952 (Bruton and Stobbs 1991).

If the captures continue to that rate, in plus of the biological factors that threaten the survival of this living fossil, there is a risk of extinction of this population in the next ten years.

Besides, the marine and coastal zone are having very stiff sub-marine slopes at some metres away from the shore, at the same time the recent volcanic formations create a situation whereby the coral reefs are not well developed. The recent rise in water temperature that has affected many regions in the globe has caused the intense whitening of some coralline formations. The over fishing in the Comorian coast has resulted in a complete decrease in ichthyological demersal resources of the coast.

E. Political, Institutional and Legal Context

E.1 Political and Institutional Context

The efforts accomplished by the Government to rectify the deterioration of the environment have been put forward by the realisation of a diagnosis of the state of environment in 1993, the elaboration of the National Policy for the Environment, (DGE, 1994) and an action Plan for Environment (PAE). The basic principle of this policy is to integrate the ecological considerations in all national sectorial policies and in the social and economical development of the country.

The National Policy for Environment (PNE) has integrated many points regarding marine and coastal issues in general and the protected marine areas in particular.

This concerns particularly the following points:

- Safeguard and protect the biological diversity and the zones of great ecological and /or natural interest.
- Develop and/or reactivate the awareness on the environment
- Set up an appropriate marine and coastal management.

For the implementation of the PNE, the Comoros Government recognises the need for a participative approach, in which all those interested (users of resources, non-governmental organisations, governmental institutions and private sector) play an active role in the management of resources. Such approach by definition is decentralized and those who are directly concerned are the responsibility of making decisions.

The resources of the country are not sufficient to implement entirely the PNE – Various environmental programmes financed by the European Union, the World Bank, the UNEP, the World Fund for Environment, will help in the setting up of the environmental plan of action.

A strategy and a national action plan for conservation have been elaborated upon in the context of the convention on the biological diversity.

The Ministry of Environment assisted by the General Direction of Environment is the institutional guarantor of the affective management of the environment.

The villagers associations and the national NGOA are fully involving themselves in the actions for the protection of the environment since the beginning of the years 90's and have asserted themselves as potential partners in the durable management of natural resources.

E.2 Legal Context

The Comoros ratified many international conventions favourable to the creation of protected marine areas. It is about6:

- The Convention on Biological Diversity
- The protocol relating to protected zones as well as the wild fauna and flora of the oriental Africa region (Nairobi, 21st June 1985)
- The Convention for the protection, the management and the valorisation of marine and coastal zones of the Oriental African region (Nairobi, 21st June 1985)
- The Ramsar Convention on humid zones having international importance
- The Convention on the international trade of endangered species (CITES)

The legal measures concerning the environment are included in the text of the law related to the environment N°94-018/AF. The conditions of classification are precised in the article 47 and 48. They can be created in the form of national park or natural reserve, with the aim of preserving them from all destructive actions, when they represent <<an exceptional interest>> in <<aesthetical, scientific, ecological and cultural>> point of view.

Studies have been carried out to identified protected species, the habitat and the ecosystems existing in the country, in view of the conservation of the biodiversity.

Many legislations (decree and decision) have been signed to better protect the natural resources in general and the species and marine and coastal zones in particular.

Awareness programmes have been initiated with the help of NGO's and the funds sponsors to sensitise and associate the villagers to the activities of the environment conservation and the protection of the biodiversity.

Actually in Comoros, there exist no protected marine area classified under an official legal text.

However there is provision for the creation of two marine parks

- The marine park of Moheli which is being implemented by the Government of Comoros, the "UICN," with GEF/UNDP funds
- The coelacanth marine park in the south west of Great Comoro which feasibility study is carried out by the Regional Programme for Environment of the Indian Ocean Commission.

The appropriateness of the legislation is not enough for the protection of natural resources in Comoros in general.

An inter-ministerial decision N°74-029/PR/MID of the 14th January 1974 relating to the capture the transfer and the detention of coelacanth prohibits the capture.

In the same way the coelacanth is classified in the annex A of the CITES of which Comoros is signatory.

However, the application of the law in general causes problems for Comoros. The application laws are made but they are not broadcasted in Comoros language.

No one controls the application, no one verbalizes, and sometimes the public inspectors are the contraventions.

On the other hand a presidential decree N°79/0121 of April 1979 prohibits the capture of turtles in the territorial waters of Comoros, and a penalty of 25000 F.C. Eight days of imprisonment and immediate seizure of all the turtles in possession, an inter-ministerial decision N°02/015 of March 1992 prohibits the collection of shells coral exploitation and the capture of turtles and their trade.

F. Evaluation of Needs

F.1 Coelacanth Park

The number of personnel needed for the implementation of the programme of the parks is

- 4 persons for leisure and tourism (audio visual/electronic technician, gardener, shop assistant, accountant)
 - 9 persons for Information, Education and Research (director of coelacanth house, maintenance and such-marine diving technician, marine biologist, responsible for international relations, librarian/public relation, maintenance technician, cleaner and 2 mechanic drivers)
- That is a total of 13 personnes.

The construction of coelacanth park is estimated to 100 millions of Comorian Francs. A global budget of investment and operation cost could be tied up towards the end of May, in the context of the finalisation of the document of the feasibility study of the coelacanth park.

The identified needs for formation are linked to the field of fish conservation, the creation of workshop for material manufacture and maintenance and the restoration of fishing boats, tourists guides, scientific and touristic animation, conflicts management, and finance and account management. There is not yet a formal funding for the park, but some sponsors (funds providers) such as UNESCO, the European Development Fund, the French Fund for Environment seem interested in the project.

F2 Park of Moheli

The number of personnel needed for the implementation plan is

- one conservator, one assistant director and 12 eco-guards. A total of 14 persons.

The annual provisional budget of the park is estimated at 277965550880 Comorian Francs (maximum) and 68081280 Comorian Francs (minimum). This budget is divided as follows in US \$ (1US\$ = 480 Comorian Francs).

Designation	Maximum	Minimum
International personnel	103 000	17 500
National personnel	62 326	52 326
Voyages	5 750	1 750
Formations	10 522	4 500
Operation Costs	33 780	21 660
Follow up evaluation	2 500	2 500
Transport equipment	72 000	39 000
Computer material	11 500	4 000
Stationery	8 500	8 500
Education equipment	5 000	2 500
Field equipment	24 500	23 000
Equipment for the Eco-guards	5 000	5 000
Equipment for the park	111 750	52 500
Diving equipment	11 500	8 500
Premese	115 000	115 000
Total	582 606	358 236

Following the formation plan of the biodiversity Conservation project, the identified needs are principally linked to the domains of marine and terrestrial

ecology, the environmental education, the management of the parks, the environmental legislation, the eco-tourism and the first aid.

F.3 Needs in Regional Cooperation

Based on the project for the coelacanth park, it's would be desirable to gather regional funds for the completion of the feasibility study and then set up of the park, also the regional institutions, such as the Indian Ocean University WIOMSA... could provide the trainings that are already identified in the pre-feasibility study.

For the park of Moheli, a cooperation between the house of tortoise of Itsamia and the regional institutions such as IFRMER, Reunion and NATAL BOARD of South Africa will have to be reinforced by protocols of understanding.

G. Conclusion

The Comoros archipelago has thus two projects for protected marine areas:

- The regional marine park for the coelacanth, in the South-west region of the Great Comoros, whereby the priority objective is the protect the coelacanth population in this zone as well as its bistoep.
- The marine park of Moheli whereby the principal objective is the protection of turtles and the coralline reefs as well as the associated biodiversity.

In the absence of guards in the coelacanth park, there should be a commitment of the villagers communities in respecting the fishing regulations. They will have to be responsables (accountable) in the management of this activity which affects the coelacanth population.

The civil local authoristies (prefecture, governorship) should also be more involved.

The envisaged measures of compensation a concrete consensus by the signing of a multipartite charter can be a sort of guarantee. The problem of economic perception on cast benefit approach, the lack of material funding for the environment make difficult the acquisition of financing for the coelacanth park. But it should be adopted a cost/benefit methodology and the make the project a national priority. The Symbolic value of the coelacanth can by itself mobilise the internation community. A status of the biosphere seems more envisageable.

The setting up of the park can be done following a gradual rising trend with a modular logic (education/information; conservation, eco-tourism, observation/scientific research) with a minimum and optimum scenario.

In the case of the marine park of Moheli, a good zoning would be reviewed in relation to the ecological data (such as the diagnosis of the reefs) and the recent socio-economic data.

It seems that a good balance in conservation/development (compensation measures and higher level training) is necessary to consolidate the process (already undertaken) of empowerment of the local communities in the sustainable management of the natural resources.

In both cases, the legitimacy of the local governorship, the setting up of durable funding mechanisms and the integration of national, regional even international networks are primordial.

G. RECOMMENDATIONS

The priority actions are in four main axis:

- The setting up of a national network of protected marine areas integrated to the regional Indian Ocean network and the East African network.

From the operational tools here below, we can identify and evaluate the feasibility of proposed solutions, analyse the needs in regional cooperation, the priorities and the national and regional problems.

- Restatement and adoption of common methodologies of monitoring and evaluating the resources, the ecosystems and the policies
- Restatement and adoption of a regional indicators system of durable development
- Creation and accreditation of measures network, of networks of competences and actors
- Formation of human resources
- Valorisation of existing standards and creation of regional standards
- International and regional labialization of sites and production processes
- Restatement of operational procedures of technical and/or organisational nature
- Experimentation of incitative economic tools notably the pollutant payer and negociable permits
- The definition and the set up of durable funding mechanism for durable operation of the APM are fundamental. Two options are proposed:
- Creation of judiciary fund centered on own fund such as the returns from tuna fishing or the sponsorship of emblematical animals such as the coelacanth, the marine turtles and the dugongs.
- The constitution of a common front which will be able to discuss with the different funds providers such as the European Union for seeking financial help.

- Develop an important partnership and vulgarise the co-management from the conception phase till the implementation.
- A legitimacy of the local governorship to function under own responsibility and control the perennisation of the conservation activities of the local populations, as well as a good application of the regulations of the park.

The customary law which is the most respected could thus be valorised. A delegation of certain power from central authority to local manage their natural resources by the regulation of the access, and the execution of protection activities. The central power could assure the roles of planification, the elaboration of policies and control/monitoring.

9. BIBLIOGRAPHIC REFERENCE