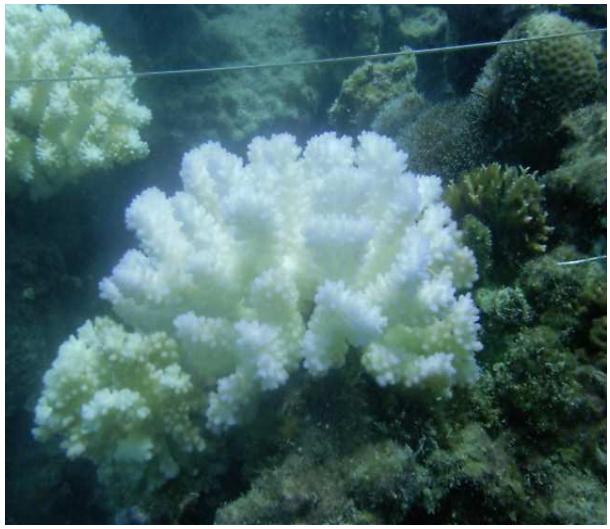
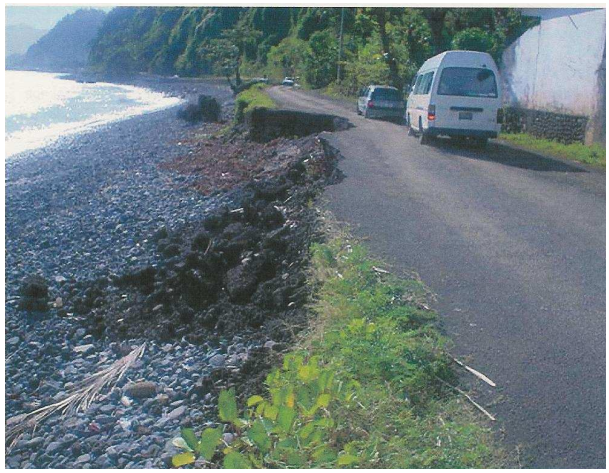
UNION OF THE COMOROS

Unity – Solidarity - Development

Ministry of Rural Development, Fisheries, Handicraft and Environment

National Action Programme of Adaptation to climate change (NAPA)





March 2006

ACRONYMS

FDA	French Development Agency
AIDE	Association for Intervention on Development and Environment
MEA	Multilateral Environment Agreements
AOGCM	Atmosphere Ocean Global Circulation Model
CAB	Cabinet
CAP	Knowledge – Attitudes - Practices
CIRAD	International Cooperation for Agricultural Research and Development
CO2	Carbon Dioxide
CP7	7th Conference of the Parties
CURE	Emergency Credit for Economic Revival
DECVAS	Development of Food Crops and support to seeds production
DSCRP	Poverty Reduction and Growth Strategy Paper (PRSP)
DSRP	Poverty Reduction Strategy Paper
EAF/14	East African
EDS	Investigations, Demography and Health
EIM	Households Integral Surveys
FADC	Funds to Support Community Development
FAO	Food and Agriculture Organization
CF	Comorian Franc
FEM	Fund for World Environment
IPCC	Intergovernmental Panel on Climate change
LDC	Least Developed Countries
MFB	Ministry of Finance and Budget
MPE	Ministry of Production and Environment
NW	North West
OMD	Millennium Development Goals
ONG	Non Governmental Organisation
PAE	Environmental Action Plan
NAPA	National Action Programme on Adaptation to Climate Change
PDRM	Mohéli Regional Development Project
PMA	Least Developed Countries
PNLP	National Programme on the Fight Against Malaria
PNUD	United Nations Development Programme
PNUE	United Nations Environment Programme
PR	State House
RGPH	General Census on Population and Housing
SAO	Substance weakening the Ozone layer
SW	South West
UE	European Union
UICN	International Union on Nature Conservation
US	United States
USAID	United States Agency for International Development
USD	United States Dollars
WWF	Worldwide Fund for Nature
ZEE :	Exclusive Economic Zone

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EXECUTIVE SUMMARY

The elaboration of the Country Action Programme on Adaptation to Climate Change (NAPA) is the fruit of a participative process based upon basic studies, field investigations, consultations and many working meetings and workshops. This Action Programme is the result of a prior analysis made on climate.

This analysis revealed an evolution of the climate marked, over the past thirty years, by precipitation fluctuations and intervals in the season, early and prolonged droughts and a 1°C rise in the average temperature.

Historical observation has shown a trend towards the increase of the extreme meteorological phenomenon during the same period. The participative evaluations on vulnerability and adaptation as well as the public investigations made in parallel, as part of this Plan of Action, have shown the great vulnerability particularly of the sectors, which ensure to the poor the basic means of existence. The sources of this vulnerability are: an economy which largely depends on the agricultural sector, fragile soils which are vulnerable to erosion and tectonic instability coupled with the zones of subsidence, difficult social and economic conditions characterized by high unemployment and poverty rates; a fragile natural environment, a comparatively high population growth, extensive agriculture; bad use of soils; inadequate institutional capabilities, a poor context of economic diversification; problems related to drinking water and to access to this resource, a concentration of the main cities on the coastal fringe, where the majority of the population live, a legislation which is outdated or which is not adequately applied; the quasi-totality of the infrastructures are built at less than 6 meters above sea level, in the absence of rules and standards for their protection against climate risks in the way infrastructures are designed and maintained ; traditional housings made of cob or straws which hardly resist bad weather.

This situation results in chronic difficulties for water supply, a reduction of the agricultural production and coastal fishing, lower income, high access costs to food and an increase in food insecurity. Diseases such as malaria, dengue, cholera, hepatitis A, typhoid as well as blindness are rapidly increasing.

Sectoral analysis and social and economic data allowed to distinguish subsistence farmers and fishermen (62%), cash crops farmers and cattle breeders (45%), the non-working populations (41%) and those who do not depend on the informal sectors (39%), as being the most vulnerable groups.

The most vulnerable zones are the areas with a low pluviometry, usually located at the eastern part of each island, with a comparatively high population growth and poverty incidence, and presenting favourable conditions to the development of malaria, water-related diseases with a lot of precarious housing. Most of the degraded soils can be found in those zones where coastal erosion is also highly marked.

The possible anticipated impacts are an accelerated reduction of the agricultural and fishing production, an increased saline intrusion in the coastal aquifers; a 20 cm rise in sea level, in 2050, with the destruction of 29% of the roads and works, by flooding; a paralysis of the economic activities; the moving of at least 10% of the population and a loss of 734 acres of cultivable lands; the disappearance of reefs and beaches with higher risks on the tourist potential; the geographic amplification and spreading of malaria and other vectorial transmitted diseases. Lastly, significant losses at the level of coastal infrastructures estimated at about 400 millions US$, e.g. 2,2 times the GDP of 2001.

The current and possible impacts of climate change are likely to undermine several decades of efforts made against poverty and precariousness, which still represent for the nation; issues of main concern. It is therefore under constraint and urgency that the country has engaged in the elaboration of this Action Programme, in order to increase its ability to resist climate change and climate vulnerability. This document does not have authority to set overall objectives in terms of development. It turns on the

development goals, which work towards adaptation, in the short and mid term, in order to increase their efficiency.

NAPA turns on the following main axes:

1. An overall view of the geographic, environmental and socio-economic context of the Comoros;
2. An analysis of the observed and foreseen vulnerability of climate change and variability; the influence of climate change and climate variability on the biophysical processes and the key sectors, as well as an identification of the most vulnerable groups or zones;
3. NAPA's objective, the implementation strategy including its links with the development programmes and the Multilateral Agreements on Environment;
4. A census of the adaptation options in the face of climate change, the conditions for a systematic integration of the adaptation in development planning, the methodology used for the ranking and prioritisation of the adaptation options.

The first big axis presents characteristics of the physical environment, the pressures on environment, population and economy on the Comoros.

The second axis analyses the vulnerability of the country to climate change by underlining its impact on the key sectors. It makes the inventory of the potential risks and climate impacts on population and economy, the analysis of the sensitivity of the resources, sectors, and the most vulnerable human groups and zones. The typology of the social categories and the particularly vulnerable zones is described. Vulnerability maps also appear on attachment A of this document. The adaptation options have been identified and analysed from the basic investigations, the outcomes of the participative evaluations and the different consultations.

The third axis analyses NAPA's links with the development programmes and the Multilateral Environment Agreements. It introduces NAPA's objective and implementation strategy and obstacles. The census of the adaptation options was conducted and the criteria for choosing such options were identified. The methodology for the prioritisation of the options is explained and the analysis of the outcome was made.

The fourth axis reviews the actions undertaken in the past to face climate change. It identifies the conditions for a systematic and successful adaptation, which are the setting-up of a coordination and implementation communication structure and introduces the process for the elaboration of NAPA's.

The consultations on the vulnerable groups allowed to bring out the priorities of each island. The quasi-totality of the first four priorities expressed by each island entity is connected to agriculture and water, which translate the concerns of the population, in the face of climate variability. The priorities at the national level have been drawn from the priorities of the islands. The first four priorities obtained are also connected to the same sectors. The difference between the priorities expressed by the islands and those obtained at the national level rests uniquely in the order that has been attributed to them. On the other hand, the first four priorities expressed from the standardization as a method of prioritisation are different in majority from those from the social prioritisation**.** The priorities expressed by the population were given greater importance.

NAPA makes a fine analysis of the options, which specifies the choices made in terms of sector by consulting the vulnerable groups. Those choices are:

Varieties that are more adapted to drought: climate forecast and the observation of the current trends seem to indicate an extension of the dry season and a drastic reduction of precipitation. Agriculture would

be the first sector to suffer from this situation. One of the accepted options is to search for and popularise the variety of crops that are mostly adapted to water-related deficit. This option appears through a research – action programme.

Soils defence and restoration and the reconstitution of basin slopes: The soils, submitted to climate excesses, which manifest themselves through the succession of a dry season and a heavy rainy season, will become leached, cleaned and sterile. The survival of the populations depends on the defence, the restoration and the reconstitution of the soils and the basin slopes. It is advisable to popularise the appropriate techniques and to support the efforts made by the farmers.

Extend water supply and improve its quality: The previous justification also explains this option. Water deficit could affect not only the agricultural sector but also water access and its quality by the populations. Poor water quality is a current issue, which affects the daily life of the populations. Climate change and water scarcity, which could result from this situation, are going to increase. The improvement of water access and quality goes through the development of a hydraulic system in the villages and the generalisation of water treatment.

Fight against malaria: following climate variability, malaria, the first cause of mortality in the Comoros, is increasing and could reach the areas that had been spared so far. The fight against mosquitoes and the adoption of preventive measures are at the root of the projected actions.

Support to eye care and surgery: Investigations have revealed a sensitive increase of the prevalence of eye diseases such as cataract, blindness linked to the reduction of ozone layer, which favours ultraviolet rays. The improvement of access to appropriate medical care particularly eye surgery is the accepted option. Cases of skins cancer have also been pointed out.

Non-metallic local construction materials: Logging for construction, framework for traditional houses and rafters for the roofs of most of modern houses contribute to the disappearance of natural forests. Sand mining on beaches compromise the future development of tourism and gives over the coasts to erosion. The promotion of alternative technologies, on the basis of non-metallic local construction materials, such as consolidated clay bricks and concrete walls, is a relevant choice.

Introduction of Fish Concentration Mechanisms (FCM): The aggravation of climate conditions, particularly the frequency of storms and cyclones will make fishing impossible for fishermen. This situation will result in the reduction of their income. The Fish Concentration Mechanisms are an adaptation option, which will allow to increase catches, in order to better value the contribution in time of work and in fishing equipments.(FCM) will further allow the constitution of food reserves during bad atmospheric conditions.

Early warning: it aims at setting-up surveillance and warning system on the risky climate situations, on the entire national territory.

Conservation of fish under ice: the rise in temperature will result in an increase of losses of captured fish, due to the lack of short term conservation means. In order to make up for this situation, it will be necessary to produce ice and place it at the disposal of fishermen and the sellers.

Fodder production: Like agriculture, cattle breeding could be undermined particularly by the loss of pastures. Fodder production was accepted as the right option to solve this problem.

Provender production: Aviculture is an activity which can be further promoted and which can contribute, in a significant way, to the supply of the animal proteins, which are lacking in the food intake of the populations. This activity can also contribute to the promotion of employment, particularly within women,

and therefore to poverty reduction. One of the prerequisites to this promotion is the control of the local production of provender, which is currently imported.

The adaptation options are covered by numbered project sheets, which appear on Attachment B of this document as well as a summary sheet.

The multi criteria analysis used as another method of prioritisation, put the Fish Concentration Mechanisms for the concentration of fish (FCM), the conservation of fish, the restoration of degraded soils and the reconstitution of basin slopes as first priorities. In spite of the fact that the order of priorities differs, the outcomes lead, in both cases, to the reduction of poverty and the improvement of food security. These two criteria were the core concerns of the population during the selection of the adaptation options and the ranking of the criteria according to their order of importance. This is the reason why the prioritisation by the multi criteria analysis proceeded to the balancing of the two criteria, which are deemed highly important, in order to assess their influence on the order of priorities of the adaptation options.

The next steps will consist in popularising NAPA document immediately after its endorsement and in sensitising the population to climate risks. The media, which followed the elaboration of NAPA, will be called upon to contribute to its popularisation, in collaboration with NAPA national and island committees. A strategy on the mobilisation of the resources from donors will be undertaken. Pilot committees and guiding structures will be set up in the areas where the projects will be promoted.

PREFACE

We are facing, through climate change, real civilisation stakes, which will dominate the common existence of men during the coming centuries. Both the combination and the simultaneity of global warming, population evolutions and globalisation effects open, indeed, an unprecedented era of disruptions in the history of humanity, the magnitude of which cannot be assessed. In spite of the uncertainty, Science foresees that climate change will threaten the way of life of all the rich countries whereas, for the poor, it will threaten life itself.

For the last reason, climate change will have a tragic impact on health, food security, economic activity, water resources and physical infrastructures. In the Comoros, agriculture already experiences serious difficulties due to higher temperatures, change in the rainfall and rain intensity, the emergence of new enemies to crops, changes in the geographic areas where a certain number of plant species are available, in response to climate evolution. The country is also exposed to cyclones and their aggravated violence, but also to the rise in ocean level or to the vulnerability of coral barriers.

These impacts are liable to provoke disruptions in this archipelago where most of its populations live along the coast, and the economy and the living conditions of which largely depend on tourism and fishing. Climate drift is particularly likely to wreck the development efforts undertaken and the specific strategies for food security and poverty reduction. Therefore, climate change does add new difficulties in the move towards sustainable development.

Today's new challenge is to face current and future impacts of climate change and to take the necessary actions in order to mitigate them. From this point of view, the National Action Programme on Adaptation (NAPA) constitutes a direct and simplified channel of communication, for the spreading of information on the urgent and immediate needs for adaptation to climate change. It allows, in the short term, to mitigate the threats on the means of existence. It constitutes, to this end, a sound basis for the beginning of a study on the needs for adaptation, in the context of the fight against poverty.

In this perspective, the country's needs go beyond the short term. The new and unknown risks and the chocks that are potentially tragic for the economic development require a much broader capacity-building, in order to consolidate and improve the long term projections on climate evolution. This capacity-building is necessary for the integration of the adaptation measures and the management of climate risks in the development programmes. This integration may however generate additional costs. In this case, the support of the international community is essential because the magnitude and the scope of climate risks require that the country acts and do so now.

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1. INTRODUCTION AND PARAMETERS

Science shows that climate change will have tragic consequences, particularly within the Least Developed Countries (LDC), due to their geographical situation and their climate conditions, their heavy dependence on natural resources, their economic backwardness and their limited capabilities to adapt to climate evolution. The impacts of climate change and variability will be much more important under the headings of human losses and the consequences on economy and investment.

Climate change can change economic growth rate and mode, aggravate inequalities and undermine the growth policies destined to fight poverty. Climate change repercussions on health affect social actors and consequently, their ability to participate in a possible economic growth.

In a context of weak economic diversity, the income opportunities and consequently the possibilities to develop alternative means of existence in response to climate change are very limited. Moreover, in the absence of a social protection net, emigration is the response strategy of the underprivileged populations and sometimes the only solution, but it is likely to lead to social disintegration.

To respond to this situation, the Conference of the Parties to the United Nations Framework-Convention on Climate Change endorsed, in 2001, the preparation of Countries Action Programmes on Adaptation (NAPA) for the Least Developed Countries (LDC). NAPA's role is to define the immediate and urgent activities to be implemented in order to increase the ability to adapt and, therefore, to resist the current and future harmful consequences of climate change and extreme meteorological phenomenon. In this spirit, the Decision 28/CP7 of this Conference established the guiding lines that frame the preparation of the NAPAs. This decision stipulates that the process for NAPA's elaboration must be guided by a complementary approach, based on the existing national plans and programmes in order to move forward with the broader objectives of poverty alleviation and Sustainable Development. This complementarity is of particular interest in the search for synergies between NAPA and the Multilateral Agreements on Environment, the chapters on adaptation and capacity-building.

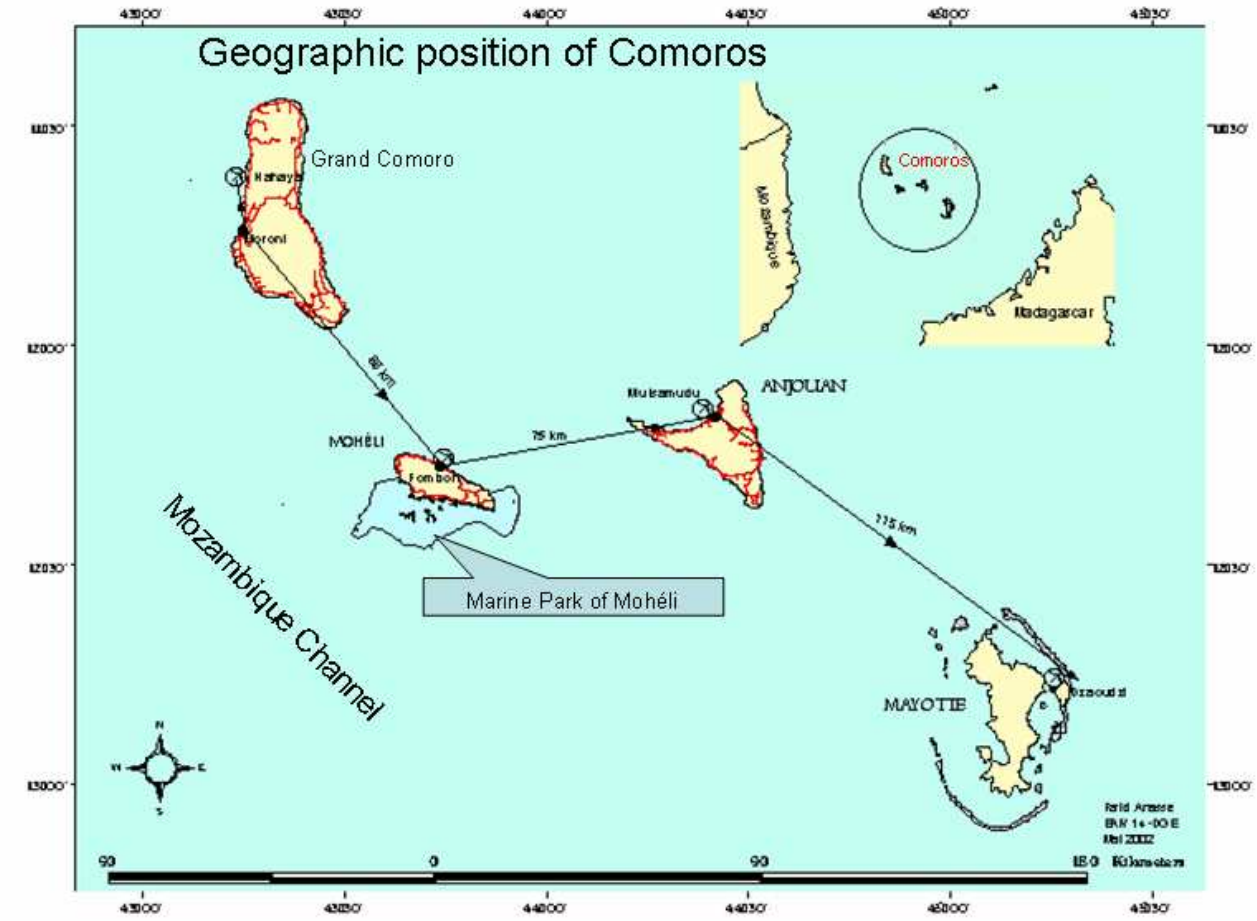
NAPAs cannot, therefore, be regarded as an isolated and punctual action. They must be integrated in the sectoral development programmes and in the process for decision-making and national planning. In this regard, they constitute a first step towards the implementation of the initiatives for adaptation to climate change and to climate variability, in the long term.

The move followed in the elaboration of this document consisted, firstly, in conducting a participative evaluation on the vulnerability of the social and economic key sectors, the ecosystems and the most vulnerable groups of populations, identified from public surveys and experts opinions.

Secondly, an inventory and an analysis of climate risks and their impacts on the sectors, the ecosystems and the involved human groups have also been made.

Lastly, from the outcome of this evaluation and this analysis, and on the basis of consultations particularly with the most vulnerable groups, priority actions have been selected, the order of priority of these options was determined and the implementation strategy identified. A systematic integration of the national strategy of adaptation in national planning is also been suggested.

Picture 1 : Map of the Comoro archipelago



2. CARACTERISTICS OF THE NATURAL ENVIRONMENT

2.1. Geographic situation

The Union of the Comoros is an archipelago composed of four islands which are, from East to West: Mayotte (370 sq km), Anjouan (424 sq km), Mohéli (290 sq km) and Grand-Comoro (1148 sq km). In spite of the accession of the country to international sovereignty in 1975, Mayotte is still under French rule. Therefore, this document refers to the three islands only.

The country is located at the northern entry of the Mozambique Channel between Madagascar and the Eastern coast of Africa, thus occupying a strategic position. The islands are separated from deep sub marine channels. The total area of the three islands, which form the Union of the Comoros, is 1862 sq km.

2.2. Geological Origin

The Comoro archipelago is exclusively of volcanic origin. On the geo-chronological plan, the latest information on the age of the three islands is respectively as follows: 1.49, 0.48, 0.36 millions years (Ma) for Mayotte, Mohéli and Anjouan (Armstrong, 1972: Emerick and Duncan, 1982, 1983: Nougier and al, 1986) and 0, 13 Ma for Grand-Comoro (Emerick and Duncan, 1982, 1983).

The island of Grand Comoro is composed of two volcano shields represented by the massif of the Northern Grille in the North and the massif of the Karthala in the South. The latter is still active. The 1977 eruption affected the village of "Singani" in the southwest of the island. The latest eruption dates back to November 2005.

The volcanoes that constitute the islands of Mohéli and Anjouan have reached a more advanced maturation stage and are deeply eroded.
Mayotte presents a more advanced evolution stage, which is still characterized by erosion and a very intense alteration.

The three islands are affected by two systems of fracture, towards North-West/South-East and North-South. At the local level, as in Anjouan and Mohéli, some signs of subsidence can be noted in Foumbouni and Malé in the Southeast, the oldest risen part of Grand-Comoro. Close to Mitsamiouli in the North-West of Grand-Comoro and Malé, the reef is splitting to give birth to the beginning of a reef-barrier.

2.3. Geomorphologic marine

The coastal and marine environment offers a great variety in its morphology (low coasts, cliffs, islets, platinum…) and in its nature (lavas, white or black sand beaches, stones, blocks, coral cliffs). Generally speaking, the continental plateau (900 sq km) is highly reduced in the west of the archipelago where the seabeds have suddenly reached depths higher to 3000 meters due to the existence of a North-South rift along the Mozambique Channel. The narrow plateau accounts for the low development of coral reefs. In the East, the seabeds are less deep and are the extension of the Madagascar continental plateau.

2.4. Biodiversity

The Comoros, from its recent volcanic nature, its exiguity and its multi-insularity offers a great originality translated by the diversity of its sceneries and the richness of its biodiversity (fauna and flora). The variety of the coastal and marine ecosystems (mangroves, coral reefs, beaches, under marine herbariums) constitutes a potential that should be protected and valued, from the tourist point of view.
On a world scale, the Comoros is among the 20 islands or archipelagos characterized by their endemic diversity (Caldecott *and al.*, 1960). The country has a great diversity of plants and an important endemic

status, which make it a place that needs to be addressed in high priority for the conservation of the world biodiversity (WWF and IUCN 1995).

The Comoros represents the extreme case of the islands presenting a very high biodiversity rate, reinforced by an altitudinal factor of (- 3000 to 2361 m). The country is classified as "hotspots zone" (high endemic status and important threats) among the six big areas of the world. However, this potential biodiversity is still not well known and is therefore mismanaged and badly protected. The number of plant species is estimated at about 2000 species on the three islands (Adjanohoun, 1982). The inventory made as part of the Regional project «Aromatic and medicinal plants – PLARM » of the Indian Ocean Commission reports at least 350 species divided in 120 families, 118 kinds and 132 species, 50 of which are endemic. The interest of preserving the biodiversity of the Comoros results from the need to ensure the stability of the ecosystem and the fact that several species, which are still unknown, have potentials for science, agronomy or pharmaceutical industry. The Comoros harbours the most important eggs-laying site for marine turtles in the Indian Ocean and the 10th in the world.

Furthermore, the Comoros is located at the end of two plancto-geographic regions with different productivity:

a) The region of the equatorial current whose phytoplankton fauna tends to be dominated by "dinoflagellum" and "coccolithophors", characteristic of "oligotrop" waters;

b) The region of the Mozambique current characterised by a dominance of diatoms, ecologic indicators of productive waters. The primary production is higher during the monsoon (rainy season: from November to April), a figure of the order of 500 mg/cm/j (Casanova, 1968).

The Comoros flora and the fauna have intrinsic economic, scientific, re-creative, aesthetic and cultural interests that deserve to be protected and valued. The discovery of the Coelacanth (Latimeria Chalumnae) in the Comoros waters, in 1938, indeed allowed to make enormous progress in the field of the anatomic evolution of vertebrates. This living fossil which, was believed to be extinct (no fossil tracks of this fish had been seen for 80 millions years) represents both an example of high endemism to the extreme and an animal the position of which in its evolution is unique.

50 species of coral have separately developed around the islands, in relation to the age of the islands and the local hydrodynamic conditions. They occupy about 60% of the coast of Grand-Comoro, 80% of that of Anjouan and nearly 100% of that of Mohéli.

Tableau 1: Summary of the endemic endangered species living on the Comoros land

Taxonomy	Number of species	Endemic	Endangered
Mammals	17	3	3
Avifauna	98	9	6
Reptiles	25 indigenous	11	2
Insects	1200	30 to 60%	? ?
Plants	935, 416 of them are indigenous	136 (43 orchids)	3
Fresh water fish	16	?	?

Sources: Thys and Tengels 1980 ; Adjanohoun and al. 1982 ; Louette and al. 1988 ; Harcourt et Thornback – 1990 ; Cole 1992 ; Clarke and al. 1992 ;

2.5. Weather profile

The Comoros has a maritime tropical weather and presents local contrasts marked by microclimate, due to the relief influence on the different climate components, particularly pluviometry. According to the seasons, the

country is successfully swept whether by the South and South-East trade winds of April to November, carrying a comparatively drier and fresher tropical air, from May to October, or by the monsoon from North to North-West which prevails from December to March, carrying hot and humid equatorial air, from November to April. The archipelago is, therefore, located within or beside inter tropical low pressures. The ground speed of the monsoon winds can reach 110 km/s in Moroni, the capital. The south sector trade wind is the most frequent. Sometimes it blows with virulence whereas the Malagasy relief always slows down the East trade wind. The wind ground speeds registered in Hahaya station, can reach 75 km/s in blasts.

Sometimes, these winds have a cyclonic nature. The yearly magnitude of the average temperature is quite modest, of the order of 4° C with a noticeable change in the relative humidity (Dronchon, 1982). The two seasons do not suddenly come one after the other, they are separated by transitional periods characterized by a continuous and comparatively rapid evolution of some climate parameters (temperature, humidity, pressure…).

a) The humid and hot season (rainy season), from mid-November to Mid-April, is characterised by a humid heat, rather frequent storms and , particularly from January-February, by some strongly disturbed episodes due to the tropical depressions near the archipelago or at the passage of « a line of convergence». The monsoon winds from North West carry this humid and hot air and a lot of rain.
In the coastal zone, the average temperature is of the order of 27° C. The maximum vary between 31 and 35° C and the minima around 23° C. During the rainy seasons, the Comoros can be the centre of tropical cyclones. Between 1911 and 1961, the archipelago experienced 23 cyclones, an average of one cyclone every two years. Some of them, born in the ocean at the north of the 15th parallel, present a real threat to the archipelago. Others are formed in the Mozambique Channel but their intensity usually decreases when they move towards the north, whereas on the contrary, they become more active when they move towards the south.
Lastly, but very rarely, the cyclone genesis can develop itself in the immediate neighbourhood of the archipelago with somehow the same repercussions on the four islands.

b) The fresh and dry season occurs from the beginning of June to the end of September. It is characterised, in relation to the rainy season, by a minor humidity, lower temperatures and quasi-permanent winds, trade winds or sea breezes.

In low altitude, the average temperatures vary from 23 to 24 ° C. The maximum turn around 28° C and the minima between18 and 19° C.

In some areas, **the south and southeast façades** of the islands, rains remain heavy in June and July, but they decrease very noticeably in August and September. The average wind speeds are particularly higher than in the rainy seasons, with a big predominance of the south-to-south west trade wind. However, in the absence of cyclonic circulations, there is hardly or no risks of fierce winds.

In all the islands, the annual pluviometry comprises between 1000 mm and 5000 mm, according to the regions. It is divided in an unequal way in time and space, according to the altitude and the exposition to dominant winds. Generally, the regions located at the west of the islands are the ones with highest rainfalls due to they exposition to the monsoons.

In the islands of Mohéli and Anjouan, maximal precipitation rise between 2500 and 4000 mm. Whereas in Grand-Comoro, they go beyond 4000mm per year at the level of the Karthala forest located on the west slope of the island. The high pluviometry of Grand-Comoro can be explained by the higher relief of this island (more than 2000 meters) and by the fact that it is located at the West of the archipelago.

2.6. Soils

The cartography of the Comoros soils and their agricultural capabilities underscores three main types of soils linked to the type of soils formation and evolution. There are the as follows:

a) **Ferrallitic soils** presenting a limited agronomic interest following a low level of fertility.

b) **Brown soils**, rich, but with a limited thickness and a high stony nature. These soils are characterised by the presence of swollen clays and result in large retreat cracks**,** during the dry season. They are well represented in Anjouan and Mohéli.

c) **Andosoils** mainly grow on a recent volcanic material. According to the level of evolution, they are more or less thick, but most of the time, they are confined, in terms of depth, to the intact or less altered mother rock. Unlike the other soils, they are characterised by a stony nature, which can reach 90 %, a high content of organic material and a high permeability. These soils can be found mainly in Grand-Comoro and are also well represented in Anjouan and Mohéli.

In spite of these constraints, the majority of these soils present great cultural capabilities because their texture is not too heavy (muddy to a mixture of sand and mud) in depth, very rich in organic material, they have significant reserves of nutritive and less acid elements such as phosphor, potassium, calcium and magnesium. They facilitate the growth of a large range of market gardening crops and industrial crops (vanilla, clove, ylang-ylang), bushy and wooded (region) as well as fodder.

2.7. Oceanographic conditions

2.7.1. Currents and tides

The Comoros is located on the way to the South equatorial current. This current is divided into two branches: a Northern branch and a southern branch, which form a cyclonic swirl around the archipelago. The existence of this swirl is also linked to the fact that the more southern waters- surface tropical waters from the south mixed with the water from the Mozambique channel- form a barrage due to their different physical and chemical proprieties. During the rainy season, the flow speed varies between 1,30 and 1,45 nautical. During the fresh season, this speed varies between 0,5 and 2 nautical, e.g. 0,25m/s. This surface current can be slowed down or accelerated by the wind regime or by the under waters and the coastal morphology. Very violent currents were observed at the west end of the island of Anjouan.

During strong waters, the tidal range can reach comparatively high values, of the order of 4 metres; this can furthermore constitutes a hindrance to sailing.

2.7.2.Swells

We distinguish:

a. Normal and maximal swells due to trade winds,
b. Long swells from the southeast of Africa,
c. Exceptional swells linked to exceptional depression phenomenon, of weak possibility of occurrence, but which should not be neglected.

These swells can reach maximal amplitude of 4 meters with a return period of 10 years and sometimes maximal amplitude of 5 meters and more, in this case, a return almost every one hundred years**.**

2.8. Exceptional events

The Comoros is regularly swept by violent winds and sometimes by tropical cyclones. From 1911 to 1961, the country experienced 23 cyclonic events, 13 from 1967 to 1976 and 7 from 1987 to 2003 with significant human and material damage. The most serious event was the one that occurred in 1950, which claimed 524 deaths, the destruction of housings and significant economic losses in agriculture.

,

The country further lives under the stress of landslides, fall of embankments and flooding, which cause the disappearance of lands, infrastructures (roads, hospitals, schools…) and human housings especially in Anjouan and Mohéli.

Other phenomena such as volcanic eruptions in Grand-Comoro, the latest ones being those of April 18th and November 24th 2005, and soils affected by gully erosion and cleaning, show the vulnerability of the natural environment of the Comoros. Over the past ten years, drought has become a quasi-permanent phenomenon and cannot therefore be considered as an exceptional event, as it is the case in other countries.

3. PRESSURES ON ENVIRONMENT

The main land housings are: lava flows colonised by a pioneer flora, which is more or less developed according to the age of the lavas, climate and altitude. There are mainly ferns, lichens, small shrubs and trees (in altitude), the mountain moors**,** the xerophile bush, characteristic of dry climates, grassy and woody savannahs, the formations of primary rainy forests, mangroves in the plains, an anthropised vegetation (fruit trees, coconut trees), progressive growing of the semi-xerophile vegetation to ericoid one, crater lakes and herbariums. These herbariums occupy very little areas in Grand-Comoro, but they seem more important in Anjouan, particularly from the Bimbini area until *la selle* island, in the south and in Mohéli. For these two islands, herbariums, such as the mangrove spaces are preferentially located in the south faces. The three islands are surrounded by fringent reefs, with a high level of endemism. These reefs are subject to heavy pressures due to human activities and natural factors (El Ninõ).

However, these environments and their richness are fragile and are now, heavily threatened by human activities in direct relation with the ecological specificities of the islands (strong slopes sensitive to erosion), social situation and the economic conditions of the population marked by:

(i) A rapid increase of the population and a human pressure which varies according to the islands and the soils,

(ii) (ii) High poverty,

(iii) (iii) Economic growth and inadequate agricultural production

(iv) (iv) Land insecurity, which does not facilitate long-term investment and micro economic imbalances at the expense of natural resources. This potential is also weakened by the climate conditions of the archipelago: heavy rains, pronounced dry seasons favourable to fires, cyclones, reefs threatened by the rise in the level of deep cold waters (upwellings) and abnormal rise in surface ocean temperatures. All these events result in the degradation of the resources mainly for:

3.1. Terrestrial environment

Rapid population growth, poverty and unemployment, soils erosion and low fertility are at the origin of the drastic reduction of agricultural space

Diminution or elimination of fallowing period.

Degradation of 57,5 % of the cultivable lands with 50 %, 65 % and 52 % respectively in Grand-Comoro, Anjouan and Mohéli.

The potential ratio of cultivable land per person is of 0,32, 0,2 and 0,6 acre, respectively for Grand Comoro, Anjouan and Mohéli. In 1984, This ratio was respectively of 0,38, 0,25 and 1 acre.

The proportion of cultivable lands with relation to the potential varies between 61 and 80 % in Grand-Comoro and in Mohéli and more than 90 % in Anjouan.

Massive deforestation of strong to very strong slopes beyond 60 to 70 % in favour of food crops, which occupy 98, 91 and 96 % of the cultivated space respectively in Grand-Comoro, Anjouan and Mohéli.

Search for new lands through forest clearing, need of firewood (55.000 m^3 for the ylang distilleries in 1991 and 170.000 m^3 in 1991 versus 468.000 m^3 in 1995 for households and 800 m^3 for wood coal), timber and wood service and lead to the disappearance of housings and loss of biodiversity, scarcity of biomass, modification of rivers regime, the narrowing of hydrographic network, the disappearance of fresh water species and the diminution of hydroelectric potential.

3.2. The coastal space

Terrigen contributions, reefs silting-up and coral stifling particularly on the reef plat

Sand and coral mining for construction with the disappearance of 90 % of beaches in 20 years, on Grand-Comoro.

Erosion and weakening of the coasts.

High pressure of non-motorised boats (4400 boats) on coastal fishing.

Threats on human housing settled, most of the time, near the coasts.

Risk of destruction of the cultural heritage and the historical sites.

Danger for the global balance of the islands with potential negative effects on tourism.

3.3. The marine space

Strong local exploitation of demersal resources near the coasts whereas the open sea potential is largely under exploited (6 000 tons/year on 20 000 tons).

Lack of monitoring means and of objective data on the exploitation of open sea resources and the risks for marine waters pollution by oil changes from boats off the coasts, as the Comoros is located on the main route of the big oil tankers from the Persian Golf

3.4. The urban area

Anarchic urban development, increase of the pollution risks aggravated by the appearance of informal housing and spontaneous districts.

Inadequate waste management and cleaning system, which facilitates the development of malaria and present potential pollution risks to ground water and shores**.**

It should however be noted that in spite of the dimension and the nature of the degradation phenomenon of the environment, the Comoros is still seen as a fortunate country and a support for a potential economic dynamics. Public awareness and the emergence of organisations for the protection of the environment, within the civil society and professional groupings can, however, constitute a significant asset for the environmental stakes.

4. POPULATION

Social and economic indicators

Chart 2 : Demographic profile of the Comoros

Indicators 2004	Comoros	Grand-Comoro	Anjouan	Mohéli
Total population	587749	302397	248850	36502
Growth rate	2,1%	2,0%	2,1%	3,3%
Men proportion	49,6%	49,4%	49,6%	51,3%
Ratio men to women	0,98	0,98	0,99	1,05
Density	309	258	575	123
Population under 20 years	53,0%			
Urban population	30%	24,2	31,7	50,2
Population from the coastal zone	65%			
Gross literacy rate	56,5%			
Population living abroad	35%			
Life span at birth	56,5 years			
Population per physician	7837			
Malaria prevalence rate	34,6%			
Proportion of underweight children under 5 years	24,9%	13,2%	32,4%	23,1%
Proportion of children under 5 years suffering from slow development	44,0%	44,2%	51,3%	32,3%
Proportion of children under 5 years suffering from emaciation	7,9%	4,8%	10,3%	5,1%
Proportion of households living in a precarious housing	10%	30 to 40 %	50 to 60%	25 to 30%
Poverty line in cf [1] (per person and per year)	285144	285144	217287	274725
Total poverty incidence of the individuals	44,8%	42,7%	46,4%	49,1%
Total poverty incidence of the households	36,9%	35,3%	38,4%	37,8%
Poverty incidence of the individuals in the rural area		45,4%	52,1%	50,2%
Poverty incidence of the households in the rural area		39,1%	43,5%	38,3%
Employment ratio – pop. Which have reached the age to work	44,2%			
Unemployment rate	13,5%	14,9%	12,1%	15,0%

Source: Commissariat General for Planning, RGPH 2003 and EIM 2004

The demographic profile of the Comoros shows that the population is mainly composed of youth especially in the rural area, and is concentrated on the coastal areas with a comparatively high growth rate and density. The rapid population growth results in the imbalance of the already limited resources and the threat of climate instability, thus causing a high poverty incidence and malnutrition, especially in the rural area where its contribution to families' poverty rises to 78,8%. The strong migration of the youth population overseas could be explained by unemployment rate. It is in this context that most of the development efforts are directed, in priority, towards the rural area through a number of programmes and

[1] CF= Comorian Franc ; 1 USD = 350 cf

projects. Family Planning programmes have allowed the reduction of the growth rate, decreasing it from 3,2 % in 1990 to 2,1 % presently.

5. ECONOMY

The economy of the Comoros is dominated by agriculture, with an extremely low annual income per inhabitant, estimated at 450 US$, thus placing the Comoros among the Least Developing Countries with a population which is growing faster than the resources. The primary sector contributed to nearly 44,3% of the GDP in 2004, occupies 70 to 80% of the active population and provides the quasi totality (98%) of the export revenues of a limited range of the cash crops directly submitted to the adverse effects of the terms of exchanges. The agricultural sector encompasses 66,9% of women jobs and 51,2% of men's jobs and covers only 40% of the food needs of the country. The secondary sector is largely traditional and represented nearly 12,4% of the GDP in 2004. The service sector is dominated by the trade of imported goods, with an annual increase rate of 3% in average per year, thus increasing the commercial deficit of the country. The ongoing and projected climate change is likely to sign away the primary sector which is already experiencing difficulties and could (i) aggravate food insecurity, (ii) increase the level of poverty of the individuals and households, (iii) increase dependency towards food imports which already absorb more than the ¾ of the export revenues and widen the chronic deficit of the commercial balance which in 2004, amounted to 21.888 millions of Comorian francs (14,9% of the GDP), e.g. 63 millions US$, in the face of a high external debt and a significant cut in public aid to development; over the past ten years .

One of the obvious consequences of this situation is the rapid increase of unemployment of the youth under 25 years (18% of the young men and 20% of the young women), which is the double of the one that prevails for those above 30 years. Moreover, the global dependency ratio, meaning the ratio between the number of non-working populations, on the one hand, (unemployed, children at charge, old people above 60 years, etc.) and the number of working populations, on the other, amounts in average to 4 persons per working populations, in 2004. This average dependency ratio is comparatively high considering the low annual income per person. The negative economic growth per person and the subsequent increase of poverty combined with climate variability will deteriorate the living conditions and make difficult the access to basic social services such as health or drinking water, and contribute to the increase of the vulnerability of the population to the negative effects of climate change.

Chart 3: Macroeconomic aggregates 2001 – 2004

Aggregates	**2001**	**2002**	**2003**	**2004**
Primary (Agriculture/farming/fishing) (1)	41%	42%	43,20%	44,30%
Contribution of agriculture to the total income of the households	-	-	-	39,4%
Secondary (Industry/Building industry/Electricity)	11,60%	11,80%	12,10%	12,40%
Tertiary (Commerce/service/administration)	47,40%	46,20%	44,70%	43,30%
GDP- Current in millions CF (2)	**131823**	**131117**	**135091**	**140699**
GDP - Constant 1990 in millions CF	**92743**	**94931**	**97470**	**99835**
GDP per habitant – current prices CF	235020	205317	205262	207562
GDP per habitant – constant prices 1990 CF	165346	148654	148099	147278
Exports (in millions CF)	7120	4707	4105	3086
Imports (in millions CF)	23070	25451	21059	24974
Commercial balance (in millions CF)	-15950	20744	-16954	-21888
Commercial balance	-12,1%	-15,8%	-12,4%	
Balance of payment (in millions CF)	8926	1750	-3212	
External debt (paying off. + interests) in millions CF	3515	3400	2841	3516
HDI (Human Development Indicia)	0,528	0,53		136th out of 177

Source: Commissariat General for Planning and Central Bank of the Comoros 2004

(1) Contribution of the primary sector to GDP (2) CF: Comorian francs

The current development situation in the Comoros is mostly dependent on the performances of a less diversified economy with a very low growth potential, affected by several structural imbalances and highly submitted to natural and external constraints of which the country has no control: geographic isolation, isolation from the international markets, high transport costs, assurance and reassurance, narrow local market in a context of limited resources, and lack of scale economies. The weak income that the population earn from economic activities, doubled with a high population growth (2,1 %) and the weakness of the means of the State, which the population depends on for the providing of basic services, are some of the causes of a poverty the level of which remains a concern (44,8 % at the national level).

However, fisheries, tourism and eco-tourism, essential oils and aromatic and medicinal plants offer interesting growth perspectives. The development of hydroelectricity, geothermic, solar and wind energies could facilitate the materialisation of these perspectives.

6. ADAPTATION PROGRAMME FRAMEWORK

6.1. Observed climate variability and climate change

The observed tendencies are characterised by:

a – a rise in the average annual temperature of the order of 1° C, over the past thirty years as shown in the following chart.

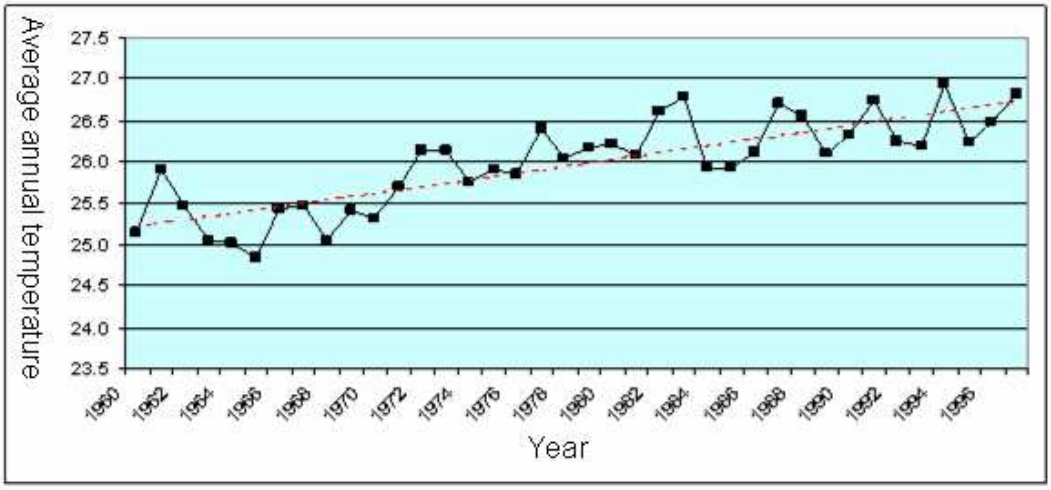


Figure 2: Curve of the temperatures observed between 1960 and 1989.

b – Irregular precipitation

It is noted, through the studied period situated from 1960 to 1989, a constant diminution of precipitation between 1960 and 1975. In 1976, the precipitation experienced a sharp increase followed by a decrease trend with strong irregularities during the remaining period (Fig, below). The heavy precipitation peaks recorded from 1976 could be assimilated to the El Ninõ episodes which have become more frequent, long and intense in East Africa since the 70s. (McMichael, 1996). For the Indian Ocean and southern Africa, these episodes are followed by heavy rains. In spite of the lack of data, after 1989, which could allow to assess the evolution of the precipitation, the observations confirm that this trend is still going on and that it is likely to continue in the future. At the same time, the frequency of cyclones and storms tends to increase and their season has become more and more unpredictable. Between 1911 and 1961, 23 cyclonic events hit the country, an average of one cyclone every two years. Between 1967 and 1986, 13 cyclonic events hit the country, an average of one cyclone per year. The year 2004 was particularly marked by violent

cyclones, in the South West of the Indian Ocean where the Comoros is located, and they claimed a lot of human losses and damage.

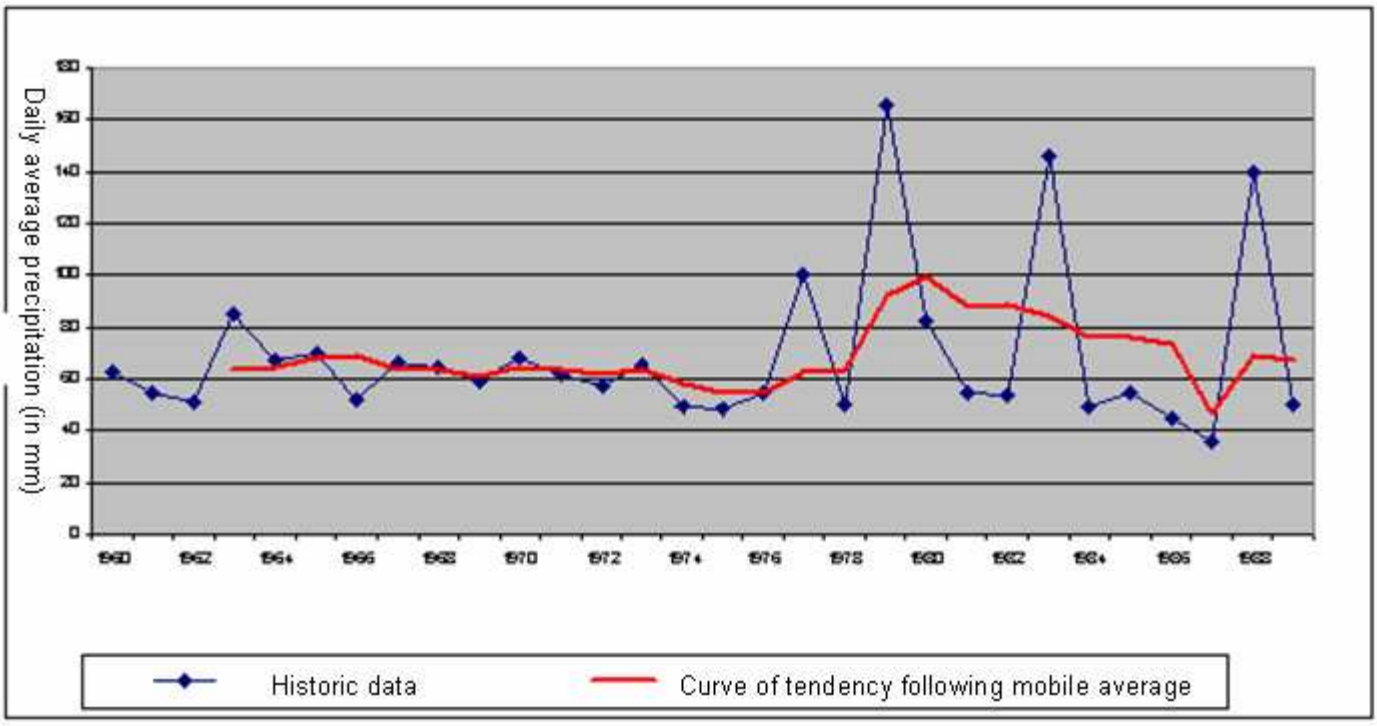


Figure 3: Curve of the precipitation observed between 1960 and 1989. (Source: national meteorological network stations)

The irregularity of the precipitation is followed by a shortening of the duration of the rainy season from 6 to 3 months indeed 2 months, in favour of the dry season, with an incidence on the local microclimate.

The aridity indicium's has therefore increased from 12 to 14, confirming the persistence of drought. Furthermore, according to IPCC, climate change scenario for the small islands of the Indian Ocean, the marine level increases at an average pace of 4 mm per year.

6.2. Variability of the climate and of the projected climate change

Regarding precipitation, the fluctuations observed between 1960 and 1989 allow to think that this trend should go on in the future, in spite of the lack of comprehensive data to assess this trend. However, according to IPCC through the projections of the Atmosphere-Ocean General Circulation Model (AOGCM), the climate change scenarios for the small islands of the Indian Ocean, for the period 2040-2069, indicate an increase of the annual average precipitation of 3,1% (+ or – 0,45%) with however a decrease which varies between -2,6 and -1,8 % during the dry seasons (June-August).
According to the projections made during the initial national communication, the annual average temperature will increase from 1°C by 2050. IPCC scenarios for the temperatures, at the scale of the islands of the South West of the Indian Ocean indicate an increase of 2,10°C by 2040-2069.

The calculated evaluation of the sea level should reach 20 cm by 2050.

The intensity and the frequency of the meteorological and extremes climate events should increase in the future.

7. INFLUENCE OF CLIMATE CHANGE AND VARIABILITY ON THE BIOPHYSICS PROCESSES ON THE KEY SECTORS

7.1. Historical recordings

Being familiar to climate conditions, Comorian farmers have noticed a certain number of historical recordings related to climate change and its variability. Globally, the farmers agree on the fact that the climate is «upset». This abnormal aspect of climate is illustrated by several empirical observations. They have all realised that it is hotter during the rainy season than in the past and that this season has moved back in time, meaning that instead of occurring in October, as it was the case in the past, it occurs in March or at another unpredictable period, thus disturbing the agricultural calendar.

7.2. Influence of climate and its variability on the biophysical processes

a) Change in rainfall, rain intensity, modifications in the average climate conditions and the seasons discrepancies disturb the hydrologic cycle with rivers drying-up and the modification of the resources of rivers regime, increase of rivers flowing which bring about flooding risks, a decrease of the ground water level and an acceleration of soils erosion. For instance, out of the forty permanent rivers that existed on the island in the 50s, hardly a dozen of them are still flowing presently, and most of them during the dry season with a reduction of the hydroelectric potential (fig. 4).

Figure 4: dried river

b) Displacement of the vegetation eras, early trees flowering, delay in the maturation of fruit as well as change in the geographic areas of a certain number of plant and animal species in response to the evolution of climate change. Some crops, which used to grow in mid altitude, better adapt to high altitude. The xerophile species grow abundantly in low altitude whereas lichens and orchids are becoming scarce in mid and high altitude. This displacement of climate zones threatens the fauna and the flora. This is the reason why species such as "*Zosterops",* the blue pigeon, "*Otus polliani"*, "humblotia flavirostris", "*Pteroptus livingstonii", lemur such as Lemur Mongoz* for the fauna, as well as mahogany, *Khaya "comorensis and Ocotea"* species in great demand in cabinetwork, "tambourissa leptophylla" and "Aphloria theaformis" used as medicines, "*comorensis"*, endemic species for the flora; become scarce. Both the already known medicinal and aromatic species and the herbaceous and bushy flora which is not well known are likely to disappear before being identified and listed by the botanists.

Figure 5: Disappearing forest

c) Heavy rains, pronounced dry season, high temperatures provoke soils cleaning, retreat cracks in the clay soils and rock falls thus accelerating the degradation of 33 120 acres of soils (50%) in Grand-Comoro, 24 200 acres (65%) in Anjouan and 8 115 acres (52%) in Mohéli. A total of 65 335 acres of agricultural lands (57,5%) are degraded on a total agricultural area of about 112 000 acres (fig. 6). This level of degradation indicates the desertification process and an acceleration of the practice of agriculture in the forest.

Figure 6 : Eroded land with outcrop of the mother rock in Anjouan

Cyclones, rise of the cold deep waters (upwelling), abnormal rise in the surface ocean temperatures and prolonged drought following the passage of El Ninõ, threaten reefs, fishing, agriculture, water resources, health and biodiversity. In 1997, a rise in the temperature of sea water from 1 to 1,5°C in relation to normal temperature (26 to 28° C) resulted in the whitening and the death of almost 60% of corals on all the islands, 80% of it on the reef plat and 60% at the level of the external slope. Between 1998 and 2005, the whitening rate observed out of 20 stations for the follow-up of the health status of the reefs is about 10%, with an increased rate of herbivore fish. (AIDE, 2005).

Figure 7: Coral whitening (Marine Park in Mohéli)

The impacts of climate variability on the biophysics processes have potentially negative effects on water resources, fishing, agriculture, energy, biodiversity, tourism and health.

7.3. Impacts on the key sectors

7.3.1. Agriculture

A strictly pluvial agriculture practiced mainly for subsistence, and which uses less or no chemical fertilisers.

An agriculture, which is not mechanised enough. It benefits from little investment and has limited technical capacities.

The influence of climate change and climate variability on the agricultural sector is visible:

Delay in fruit maturation due to prolonged droughts and high temperatures. Corn production affected by drought. The first region that produces this foodstuff is also the most exposed to the reduction of rainfall. The crop decreased from 4000 tons in 1999 to 3500 tons n 2000 (see chart 4).

The cycle of reproduction of the crop enemies coincides with the crop period. This coincidence causes crop destruction. The appearance of new diseases such as coconut aleurodidae (*Aleurotrachelus atratus)* (figs 9, 10) results in the decrease of production and income (Chart 5).

Deposit of sooty molds through aleurodidae, on the associated crops (vanilla plants, banana trees etc…) figs 11 and 12, thus compromising photosynthesis.

Development of cercosporiosis (*cercorporella fujiensis*) on banana trees and losses of important crops, reduction of income and increase of food insecurity (Chart 4).

Figure 8 : healthy coconut tree

Chart 4: Evolution of the main food crops.

Products	**1999 (in tons)**	**2000 (in tons)**	**Variation in %**
Crop	4000	3500	**-12.5**
Cassava	51900	45000	**-13.3**
Other tubercles	6100	5000	**-18**
Beans	470	400	**-14.9**
Bananas	59000	57000	**-3.4**
Sweet potatoes	1300	1000	**-23.1**

Report of the Central Bank of the Comoros, 2000.

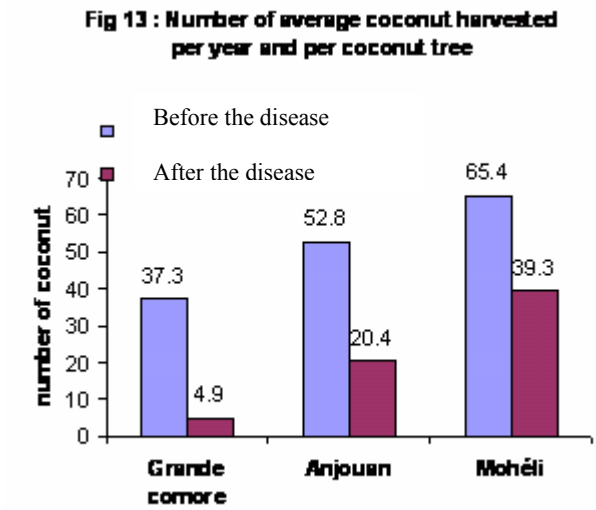
As the quasi totality of the village soils are already exploited or degraded, the villages communities are fighting over the remaining spaces, thus generating inter communities' disputes as for the ownership of the soils and the natural resources. The village communities encroach upon the State-owned lands and tend to question State ownership of the occupied lands.

Figure 9 : Coconut tree affected by aleurodidae

Figure 10 : dead coconut

Figure 11: sooty molds on a banana tree

Figure 12 : sooty molds on a vanilla tree



Source: Cécile Malaval, 2004 ; DEA Monograph - « Study on the coconut tree sector»

Chart 5 : Significant decrease of the annual income per producer (2004)

Islands	Before the disease	After the disease
Grande Comoro	168.600 CF (481 US$)	16.000 CF (46 US$) (e.g. 90 %)
Anjouan	482.700 CF (1379 US$)	149.600 FC (427 US$) (e.g.69%)
Mohéli	1.436.000 CF (4103 US$)	778.400 CF (2224 US$) (e.g.54.2 %)
National	**695.767** CF (1988 US$)	**314.667** CF (899 US$) **(54.8%)**

At the social level, the most destitute populations are facing a more difficult access to food. Indeed, the decrease in the production of local food crops has resulted into price increase. This situation changes the competitivity of local production, with regards to the imported foodstuffs particularly rice. It forces households to spend most of their food budget on food consumption. For the poor, this rate has currently reached 64,7% against 60,8% for the rich. We note that some forms of children malnutrition are increasing. Indeed, while the emaciation and weight insufficiency rates decreased from respectively 8,3% to 25,8% in 1996 to 7,9% and 24,9% in 2004, slow development has increased at the same period from

33.8% to 44%. Dependency towards the import of food products is increasing. The most destitute populations are forced to rural exodus in order to try and avoid precariousness, following the degradation of cultivable soils and income cut.

7.3.2. Forest

Land degradation is accelerated by climate variability thus causing the disappearance of 400 acres of forest per year.

Between 1974 and 1985 the forest diminished from 19 100 to 12 375 acres, a global reduction of 35 % with an annual reduction rate of 3,1; 1,3 and 6,1 % respectively for Grand-Comoro, Anjouan and Mohéli. Deforestation rate has reached 36% in Grande-Comoro (- 5000 ha), 74% on Anjouan (- 5950 acres) and 53% in Mohéli (- 1800 acres). (AGRAR, 1985). The residual forest was of 33,2% in Grand-Comoro, 16% in Anjouan and 28,6% in Mohéli (FAO 2000).

Figure 14 : disappearing forest in Anjouan

Figure 15 : Dried forest in Anjouan

7.3.3 Cattle-raising

Cattle breeding which is traditional and exposed to bad weather includes 234.000 ruminants 74% of them are goats, 18% are bovines and 8% ovine. Prolonged drought leads to the reduction of pasture, through the drying out of grasses. Furthermore, land degradation and the disappearance of the practice of fallowing land limit fodder production capacity. The reduction of water resources reduces the drinking possibilities: most of the time, banana trees are chopped to water cattle. This leads to under nourishment and a high sensitivity to parasites and epidemics such as “theleriosis”, which decimated 20% of bovines in Grand-Comoro, thus decreasing them from 55000 heads in 2002 to 45000 in 2003.

Poultry: 160.000 heads in traditional farming and 24.500 heads for semi industrial farming pour. High temperatures diminish the food ingestion capacity especially for traditional farming, thus reducing an already weak production.

Farming in the Comoros represents only 8% of the GDP.

Climate disturbances have a negative influence on the local production of meat thus leading to an increase of the country’s dependence on imported proteins. The high access cost for the most destitute populations exposes the latter to chronic malnutrition.

7.3.4 Fisheries

Traditional fishing covers 40% of the needs in animal proteins. The offshore pelagic potential is of 20 000 tons exploited only up to 6 000 tons (30 %). The continental plateau is of 900 sq km, ZEE covers 160 000 sq km. The demersal resources of the continental plateau is believed to be of 450 to 1 350 tons per year, 900 to 2 700 tons per year for the coastal pelagic resources.

Low level of reconstitution of the stocks of demersal species, regular diminution of the size of catches.

The abnormal rise in ocean temperatures results in the whitening of coral thus leading to a high coral mortality. Reefs disappearance favours coastal erosion and speeds up the diminution of coastal fishing. Consequences: decrease of the fishing income; important losses after catch due to high temperatures in the absence of means of conservation of the products and to the limited fishing times during the cyclonic period and heavy rains. This results in a chronic deficit of fish in the market and a difficult access to it, especially for the most destitute populations.

Chart 6 : Main fishing characteristics in the Comoros

	Grand-Comoro	Anjouan	Mohéli	Total
Fishermen	4 500	2 400	1 100	8000
Small non-motor boats	2 855	1 020	525	4 400
Small motor boats	280	130	75	485
Continental plateau (sq km)	363	242	292	897
Dens. fishing. per sq km of the continental plateau	12,4	9,9	3,8	8,9
Minimal resources	545	363	438	1 346
Maximal resources	1 634	1 089	1 314	4 037

Source: World Bank, 1993

7.3.5 Water resources

Climate variability has a negative influence on the quantity and the quality of water resources through the reduction of precipitation.

Precipitation variations, season disturbances and prolonged droughts provoke early water shortages, difficulties in food preparation and deteriorate hygiene conditions. Moreover, high temperatures increase real evapotranspiration, thus reducing ground water supply rate

In Grand-Comoro, the rise in marine level increases the salinity of ground water. In the 80s, the digging of 44 reconnaissance wells on the coastal area of the island revealed that only 24 wells present salinity under 3g/l.

Anjouan and Mohéli are mainly supplied by river waters. The diminution of precipitation reduces the hydrographic network. Products from erosion, the rejected faeces as well as household and other wastes alter the quality of river waters.

The bacteriological analyses made in Anjouan indicate that 60% of the harnessed waters are contaminated at 100% and only 20% are not. This is the main cause of frequent cases of hepatitis A and especially typhoid fever which has been raging on the island for several years and which is responsible for many deaths. In Grand-Comoro, the quality of the tank water is not good either. According to a survey on the Knowledge, Aptitudes and Practices (CAP) conducted in 1999, out of 1813 households of the three islands, 29% have non-protected tanks.

With FADC, a rehabilitation programme of the infrastructures for water supply is about to be launched for a rationalisation of water management.

Chart 7 : Evolution of the water demand for the years 2002 and 2025

	2002			2025		
	Population	**Supply (m3/j)**	**Demand (m3/j)**	**Population**	**Supply(m3/j)**	**Demand (m^3/j)**
Grand-Comoro	297 440	11 000	39 500	532 232	11 000	70 680
Anjouan	240 240	7 500	15 000	437 988	7 500	27 347
Mohéli	34 320	1 500	2 500	64 245	1 500	4 680
Total	**572 000**	**20 000**	**57 000**	**1 034 465**	**20 000**	**103 085**

Source : Directorate for Energy and Water Resources (2005)

With the current supply, the specific consumption per person is of 35 litres per day; it is therefore under the 50 litres per day and person, accepted as necessary average for the basic current needs. In 2025, and assuming that the supply remains the same, the average consumption will decrease to 19 litres per day.

In addition to the limited waters available, the low density of the branched out networks, which supply from the head tank, does not allow the effective supply of the resource. For this reason, the populations that are not supplied pierce the main pipe, thus creating connections that are not listed, in order to have access to the resource; this situation results in considerable losses and a deterioration of the water quality. It will therefore be judicious to develop water supply links, in order to get a better densification of the networks that will allow to limit the depletion of the resource, and ensure the storage and the preservation of the water quality.

The current vulnerability of the water resources is also due to the fragile balance of the fresh water – salt water (Mohéli, Grand-Comoro), the risk of contamination of the ground waters (Mohéli, Grand-Comoro), and a quantitative and qualitative decrease of the surface waters (Anjouan, Mohéli). It is therefore imperative for the country to double its efforts in order to improve access to drinking water for the current and future generations. Sullivan *and al.* (2003) study mentioned in the «Water Dialogue», determined the indicia of climate vulnerability for four Small Islands Developing States and has come to the conclusion that the Comoros is the most vulnerable country considering the current climate conditions

7.3.6 Health

Climate variability, particularly temperature rise results in:
The increase of malaria prevalence, diarrhoeic diseases and acute respiratory infections
Malaria is the main motive for consultation (30%), hospitalisations (25%) and the death of children under 5 years (25 %). With the rise in temperature, its incidence increases from 33% in 2000 to 34,6% in 2004, and extends to zones of altitudes, which used to be spared. This trend comes from the high prevalence of malaria all through the year, in relation to the seasons and the regions, following climate conditions. Malaria still remains one of the main causes of mortality. In 2002, out of 7157 recorded deaths, only 20% were due to malaria

Climate variability also provokes frequent dehydration cases among children, the sick and old people. The depletion of the ozone layer contributes to climate warming, to the increase of the incidence of ultraviolet rays and consequently to the increase of the prevalence of eye diseases (*photokeratitis, solar and acute retinopathy, and cataract*) and skin cancers. According to specialists, cataract is the main cause of blindness in the Comoros. The number of people to be operated on for this disease rises by around 3240 to 4320. The number of partially sighted is estimated between 9720 and 1300 peoples.
2300 to 3050 individuals are currently waiting to be operated on and 540 peoples become blind every year, because of cataract, in a population of about 588 000 inhabitants. Finally, new diseases transmitted by mosquitoes, such as alpha virus (***Chikungunya***) have appeared in the country. There is also an increase of 0,8 % of the households health expenses.

7.3.7. Infrastructures

Shortening of the rainy season, with sporadic, abundant and sometimes violent precipitations. The acceleration of deforestation is followed by an increase of running up, which provokes rivers flooding. The soaked lands become unstable and provoke landslides and rock falls. This phenomenon is always seen on the islands of Anjouan and Mohéli, where rock falls block and sometimes destroy roads and bridges. The surrounding lands are flooded thus damaging public infrastructures such as hospitals, schools and sport fields. From February 26 to 27 2003, the flooding of a river caused the flooding of 99 % of the district of a village in Mohéli. The violent intrusion of the sea during storms is at the origin of the damage caused to the infrastructures located on the coast along the villages of Mirontsi and Pomoni on the island of Anjouan. An oil station was partially destroyed. The same phenomenon caused the disappearance of a primary school in the village of Itsamia, at the south of the island of Mohéli. The health centre and the turtle house as well as 20 % of the houses are under threat. On the same island, many villages are under threat and, in some of them, some districts have completely disappeared and their inhabitants were obliged to move. The localities of Iconi and Mbachilé in the North of this island are threatened by sea intrusion. In

the village of Bangoi-Kouni, at the North of this island, the rise in the sea level of March 1st, 2006, submerged two districts. Twenty houses were swallowed up by the sea, which crossed the levy built to protect the village from the waves (fig.16).

Figure 16: Overflowing of the levy built to protect The village of Bangoi-Kouni (North of Grand-Comoro) by the Swells and flooding of two districts (March 1st 2006).

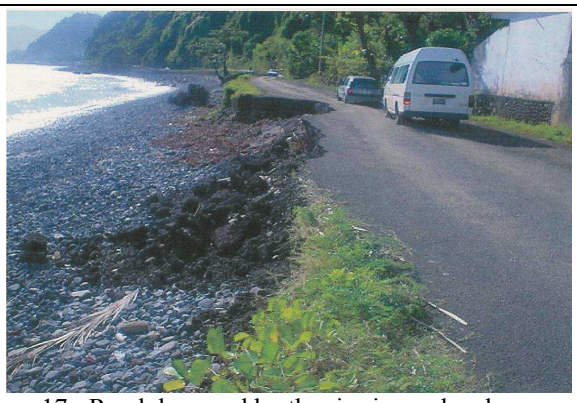


Figure 17 : Road damaged by the rise in sea level (Pouzini road – Anjouan)

8. IMPACTS OF CLIMATE CHANGE

8.1. Potential impacts

The potential impacts are geophysical and socio-economic.

At the geophysical level, it is very likely that the increase of climate events as well as their incidence assert themselves even more.
If the ocean temperatures were to rise to 1.5°C in relation to the normal temperatures, as it was the case in 1997, this rise would result in coral whitening and the disappearance of the reef. This whitening could have a direct impact on the deep-sea fisheries resources due to the diminution of the young fish populations. This could lead to losses of income related to fishing, but also to the tourist services of the reef. Indeed, the study conducted in 1998, as part of the Regional Environmental Programme of the Indian Ocean Commission, estimated at one billion two hundred million francs (e.g. 3,5 millions USD), the economic value of the tourist services of the coral reef, for the unique area of the Mohéli Marine Park. This value represents 1,3% of the GDP, 15,2% of public investments and 10,7% of the exports of goods and services. Under the same study, the annual tourist value of the coral reefs in the Comoros is estimated at 3 billion Comorian francs, e.g. 8 millions US$.

The rise in sea level and the hydrodynamic coastal changes could reduce the availability of marine aggregates (sand and coral) for construction.
This reduction could result in the increase of the shortage of this construction material, which meets twofold needs, for the coastal villages:

1. The construction of private houses,

2. The exploitation is, after fishing, the second source of income for the coastal populations.

Furthermore, these aggregates constitute an alternative to crushed sand and cement, the price of which are out of reach, particularly for the poor.

Regarding fishing, the reef fish that the populations prefer to pelagic fish could diminish, thus increasing the situation of chronic malnutrition. Nearly 7% of the population draws their means of existence from these reef fish.

A rise in the ocean temperature could lead to the reduction of the calcification rate, due to the increase of CO_2. This thesis is however still questioned.
The saline intrusion in the oils and ground waters as well as an accelerated erosion of the coasts will require the moving of at least 10 % of the population. Moreover, this would result in the loss of 734 acres of cultivable lands.

Most of the big cities and towns, road, ports, airports, tourists infrastructures, hydrocarbons warehouses, power plants, historic monuments located near the sea will be likely to disappear. The total socio-economic value of the losses related directly to climate change on the coastal zone would amount, in 2050, to 170 billion Comorian francs in current value, e.g. 486 million USD. This amount represents 2, 2 times the GDP of 2001, in real terms.

Regarding health, the rise in temperature and the intense and long heat waves related to humidity could lead to the extension of the geographical areas of malaria and cardiovascular diseases, and therefore increase the morbidity and mortality rates among children, the poor and the old people. It is foreseen that considering the resistance of malaria to current treatments, out of 8425 deaths that will occur in 2010, 20% of them will be caused by malaria. The increase of the prevalence of water-related diseases and the transmission by carriers is also a foreseen consequence of the rise in temperature and the frequency of extremes meteorological events such as cyclones and storms.

On the agricultural level, the loss of fertility of the cultivated lands and their degradation could be accelerated and result in chronic famine and an increase of poverty, forest clearing and deforestation, particularly in rural area. The increase of the population and poverty, forest clearing and deforestation, for agricultural purposes, would result in the extinction of the remainder of the national biodiversity heritage. Concerning water, the modification of the rivers regime, acute and prolonged droughts due to the irregularity of precipitation will result in water scarcity. The 2004 Household Integral Survey, which has taken into account this situation and the population projections, foresees that the water resources per person will decrease to more than 25% by 2010, if no action is taken.

These predictions are close to those established by the UN Economic Commission for Africa, the 2000 World Environment Future, UNEP and Earth Scan (1999). These predictions indicate that the Comoros will suddenly go under a situation of shortage, by 2025.

These potential impacts could undermine the efforts undertaken by the country to fight poverty and could prevent the realisation of Millennium Development Objectives.

8.2. The most important impacts felt by the population

The impacts considered by the population as the most important are obviously those that directly affect their daily life.

Chart 8 : Impacts felt, by order of importance:

1. Acute drought, early and long water shortages;
2. Degradation of 57,5% of cultivable lands;
3. Decrease of the production of some crops;
4. Reduction of coastal fishing;
5. Food insecurity;
6. Decrease of the agricultural incomes;
7. Vulnerability of the traditional housing to extremes meteorological events;
8. Unemployment and precariousness particularly among the youth;
9. Diminution of the use of hydroelectric energy during the dry season;
10. Increase of the food expenses: 64.2% of the household incomes;
11. Rural exodus, migrations and emigrations;
12. Increase of food imports;
13. Highest cost of access to food and water;
14. Persistence of malaria in the malaria-affected areas, main cause of 30% of hospital consultations, responsible for 25% of the deaths among children under 5 years;
15. High prevalence of diarrheic diseases and acute respiratory infections;
16. Apparition of new diseases such as alpha virus (*Chikungunya*);
17. High prevalence of cataract and many cases of blindness (3050 persons in 2005);
18. Increase of the cases of dehydration and cardio vascular diseases;
19. Increase of health expenses (0,8%).

9. SYNTHESIS OF THE POTENTIAL RISKS AND IMPACTS

On the basis of the participative evaluations, an inventory of the current and future climate risks on the resources, the sectors, the geographic zones and the most vulnerable human groups has been conducted and the weight of the risks assessed as well as the possible trends. The inventory of the risks and the analysis of the impacts associated with it have allowed the ranking of the climate risks according to their degree of harmful consequences. There are : Cyclones, heavy rains, increase of the atmospheric temperature and acute drought. However, due to its frequency (annual), drought can constitute the most recurrent risk in comparison to cyclones (once every two years) although a yearly trend has appeared since 1987. This analysis has contributed to the choice of the adaptation options and allowed a first ranking in relation to the indicators of exposition of the different sectors, environmental goods and services.

Chart 9 : Synthesis of climate risks

Climate risks	Vulnerability	Economic Impact	Losses in human lives	Morbidity rate	Duration	Scope	Frequency	Trend
		Scale (1 – 5)						
Seasonal drought	Reduced productivity, loss of capital, water shortage	1	1	1	1	1	3	↑
Acute drought	Decrease of the agricultural productivity, loss of capital, loss of biodiversity, threat to food security, dependence on food imports and high costs, social crisis, risk for the economy, increase of famine, migration, water shortage, etc…	4	2	2	2	2	2	↑
Increase of the Ocean temperature Augmentation	Coral whitening, damage to marine flora and fauna, reduction of coastal fishing, loss of the income related to tourism, increase of the decalcification potential, reduction of the capacity of the ocean to be a CO_2 shaft, food intoxication	3	1	2	2	4	1	↑
Increase of the atmospheric temperature	Loss of crops, high loss of capital, threat to food security, water shortage, diseases amplification –malaria, cataract, cardio-vascular diseases	4	2	4	3	3	3	↑
Heavy rains	Local flooding, damage to infrastructures, loss of crops, water pollution, water-related diseases, increase of larva shelters, lands degradation	3	1	2	1	2	2	↑
Cyclones	Regional flooding, damage to infrastructures, health problems, migration, loss of human, intrusion saline water, loss of crops, capital, biodiversity, coastal erosion, loss of beaches,	5	3	4	1	3	1	↑
Rise in the sea level	Damage to infrastructures, intrusion saline water, deterioration of the quality of fresh waters, coastal erosion, diminution of fishing income, disappearance of beaches, loss of land and capital, moving of populations.	5	1	1	1	2	2	↑

Notes:
Economic impact (loss in $ / person): 1 = 100 $; 2 = 500 $; 3 = 1.000 ; 4 = 2000 ; 5 = more than 4000 ;
Loss of human lives (number of persons): 1 = 100 ; 2 = 500 ; 3 = 1.000 ; 4 = 1500 ; 5 = more than 2000 ;
Impact on human health (number of persons) : 1 = 500 pers. 2 = 1.000 pers. 3 = 10.000 pers. 4 = 20.000 pers. 5 = more than 30.000 pers. ;
Duration (days): 1 = 10, 2 = 100, 3 = 200, 4 = more than 200
Scope (sq km): 1 = 500 sq km; 2 = 1.000 sq km ; 3 = 1.500sq km; 4 = more than 1.500 sq km
Frequency (annual probability): 1 = some years, 2 = 1 year out of 3, 3 = yearly
→ : strong trend → : Average trend → : Weak trend

10. ANALYSIS OF THE SENSIBILITY OF THE RESOURCES, SECTORS, ZONES AND THE MOST VULNERABLE HUMAN GROUPS.

The below chart analyses the sensibility to climate risks of the environmental goods and services, sectors and the most vulnerable groups of stakeholders.

Chart 10 : Analysis of the sensibility to climate risks

	Climate risks							Indicator of exposition (in %)
	Season drought	Acute drought	Heavy rains	Increase of the Ocean temperature	Increase of the atmospheric temperature	Cyclones	Rise in sea levels	
Environmental Goods and Services				**Scale (1 to 5)**				
Soils fertility	1	4	4	1	3	2	3	51
Water resources	3	5	2	1	4	4	2	60
Biodiversity	1	3	2	4	3	3	2	51
Lands exposition to risks	1	3	4	1	3	5	3	57
Sectors								
Agriculture	2	5	3	1	4	5	2	62
Cattle breeding	2	4	2	1	3	4	1	48
Infrastructure	1	2	3	1	1	5	4	48
Fishing	1	1	2	4	2	5	2	48
Health	2	4	4	1	3	5	1	57
Vulnerable groups								
Small farmers	2	5	5	2	4	5	2	71
Workers informal sector	1	3	3	1	2	4	1	42
Cattle breeders	1	4	3	1	4	5	1	54
Fishermen	1	2	4	4	2	5	2	57
Indicator of impact (%)	**25**	**70**	**75**	**40**	**60**	**95**	**30**	

The sensibility of the sectors, environmental goods and services as well as the most vulnerable groups to identified climate risks is assessed by the indicator of exposition. The latter indicates that subsistence agriculture is the most vulnerable sector followed by health, cattle breeding, fishing and infrastructures. Regarding the environmental goods and services, the indicator of exposition shows that water resources are the most vulnerable, followed by lands, soils fertility and biodiversity. Concerning the vulnerable groups, the indicator of impact shows that small farmers constitute the most vulnerable category of population, followed by fishermen, cattle breeders and workers from the informal sector.

11. TYPOLOGY OF THE PARTICULARLY VULNERABLE GROUPS

Both the vulnerability degree of the different sectors of activities and the social and economic data available, have allowed to distinguish the three groups of population that are the most vulnerable.

The first group concerns the subsistence farmers and the fishermen 62%), the second group gathers the cash crop farmers and the cattle breeders (45%), the non-working populations (41%) and those who don't depend from the informal sector (39%). The third group concerns the households with a salary and the unemployed with a poverty incidence between 25 and 35%. The poverty incidence among the farmers – cattle breeders is above the national one and involves more than 60% of these households (EIM, 2004).

12. TYPOLOGY OF THE MOST PARTICULARLY VULNERABLE ZONES

The following factors have been accepted in defining the priority zones of intervention:

(i) Poverty level, (ii) pluviometry level, (iii) high incidence of malaria and water-related diseases, (iv) housing precariousness, (v) level of lands degradation, (vi) level of wood consumption as source of energy.

On the island of Mohéli, the majority of degraded soils are located at the North and the West, then at the South West of the island. In these regions, the topographic maps published in 1997, by the Paris national geographic institute (IGN), indicate that costal erosion is more acute on a distance which varies between 0,3 and 2 km. Located at less than 5 m altitude, they present high flooding risks. They also correspond to the most populated regions of the island where land pressure and poverty incidence are acute (30 to 40 %). Malaria prevalence (26 to 43 %) as well as diseases of water-related origin (19 to 42 %) is relatively high. The South West zones including the islets where the marine park is located, shelters the egg-laying sites for marine turtles.

On the island of Anjouan, the most degraded soils are located mostly along the East slope and the North West one, according to .IGN maps, coastal erosion affects a length that varies between 1 and 2 km whereas at the North West, erosion reaches a distance of 1 to5 km of the coast. These zones are more exposed to flooding and to the rise in sea level. The East slope and the peninsula of Nioumakélé are the least watered zones, and the most populous of the island. Malaria prevalence (15 to 60 %), diseases of water-related origin (1 to 6 %) and poverty incidence (25 to 40 %) are the highest. As the North West is more watered, malaria incidence (20 to 30 %) and the diseases of water-related origin (more than 6 %) are comparatively high.

On the island of Grand-Comoro, the majority of degraded soils are located in the Northwest, the East and the South are also the most populated areas. These regions are also the ones with the lowest rain falls on the island, with a poverty incidence which varies from de 24 to 54 %, a malaria prevalence of 30 to more than 50 % and diseases of water-related origin of 3 to 5 %. The North West and the South East present eroded coasts of a length comprising between 1,5 and 3 km. These zones also present important flooding risks from the rise in sea level; according to the IGN topographic maps.

As Comoros agriculture is strictly rainy, crops in these zones suffer more from water shortage than the rest of the agricultural regions of the country.

The projects have been allocated to the different zones on the basis of these conditions (see vulnerability maps).

13.NAPA'S RELATIONSHIP WITH DEVELOPMENT PROGRAMMES AND MULTILATERAL AGREEMENTS

NAPA was created on the basis of the existing programmes, in order to increase their efficiency. In this way, it constitutes an important lever for the next programmes, contained in the Poverty Reduction Strategy Paper (PRSP) projected for 2006 - 2009. Indeed, PRSP targets the sectors that employ most of the poor and that can foster growth, such as agriculture; fishing, health, housing, infrastructures, tourism, trade, etc. NAPA is the operational extension of the PRSP, as it includes among its adaptation priorities, agriculture, fishing, water, housing, health, but also tourism, in an indirect way, through the reconstitution of basin slopes and the fight against soils erosion, and therefore the protection of reefs by limiting the silting up by terrigen contributions.

Chart 11 : Links with the health sector

Programmes	Objectives	Actions	Framework	Schedule of repayment	Overall Budget (millions USD)	Amount obtained (Million USD)	Amount to prospect (million USD)
1. Fighting malaria	**Reducing mortality and morbidity rates linked to malaria**	▪ To increase the availability of treated mosquito nets and appropriate and to facilitate access to the ▪ Promotion of the integrated fight against the vectors ▪ Training of health community on the workers agents on the reimbursement of health care related to malaria ▪ Population awareness ▪ To ensure warning and respond to epidemics	Millennium Development Goals (Goals 4, 5 and 6 MDG) PRSP & PRGSP	2006-2009	8,63	2,30	6,33
2. Reinforcing health services		▪ Capacity-building in the national hospital centre ▪ Promotion of alternative financial mechanisms for the care of the poor	Millennium Development Goals (Goals 4, 5 and 6 MDG) PRSP & PRGSP	2006-2009	15,81	0,64	15,17
TOTAL					**24,45**	**2,94**	**21,51**

Tableau 12 : Links with the farming sector

Programmes	Objectives	Actions	Framework	Schedule of Repayment	Overall Budget (million USD)	Amount obtained (million USD)	Amount to prospect (million USD)
4. Protecting the local livestock from infectious diseases and intensify the animal production sectors	**To ensure food security and fight against poverty and hunger**	▪ To reinforce the protection of livestock against diseases and epizooties - To reinforce the legislation pertaining to the control of sanitary zoo- along the borders - To set up veterinary hospitals and a purchase and supply centre for the veterinary products ▪ To intensify the dairy production through the cross-breeding of the local race with improved sire	Millennium Development Goals (Goal 1 MDG) RSPP & PRGSP	2006-2009	9,34	0,03	9,32
TOTAL					**22,13**	**0,20**	**21,92**

Chart 13 : Links with the water and environment sectors

Programmes	Objectives	Actions	Framework	Schedule of repayment	Overall Budget (million USD)	Amount obtained (million USD)	Amount to prospect (million USD)
1. Improving the urban areas	**To promote a sound environment and to ensure development sustainability**	▪ Waste management ▪ Master sketch of development of agglomerations	Framework law on environment. Millennium Development goals (Goal 7 MDG) PRSP & PRGSP Rio Conventions	2006-2009	3,65	3,09	0,56
2. Conservation of natural resources		▪ To create a network of protected areas co-managed with the local communities ▪ Alternative economic activities	Framework law on environment. Millennium Development goals (Goal 7 MDG) PRSP Rio Conventions LCD Convention	2006-2009	3,39	-	3,39
3. Implementation of the integrated management policy of the coastal zones		▪ To promote local construction materials ▪ To fight against the pollution of coastal ecosystems	Framework law on Millennium Development goals (Goal 7 MDG) PRSP & PRGSP Rio Conventions Nairobi Convention Barbados Action Plan	2006-2009	0,59	-	0,59
4. Sustainable management of water and increasing the coverage rate		▪ Access to drinking water ▪ Protection of water resources	Framework law on environment. (Goal 7 MDG) PRSP Rio Conventions LCD Convention	2006-2009	28,79	8,57	20,22
5. Restoring the degraded soils and sustainable management of forests resources		▪ To defend and restore soils ▪ Management of fertility through agro forestry ▪ Land Security ▪ Reconstitution and protection of forests	Framework law on environment. (Goal 7 MDG) PRSP Rio Conventions Nairobi Convention Barbados Action Plan	2006-2009	13,02	2,01	11,00
TOTAL					**49,45**	**13,67**	**35,78**

Chart 14 : links with the farming sector

Programmes	Objectives	Actions	Framework	Schedule of repayment	Overall Budget (million USD)	Amount obtained (million USD)	Amount to prospect (million USD)
1. Support to the restructuring and the consolidation of the land heritage	**To ensure food security and fight against poverty and hunger**	▪ To clarify the statutes of agricultural lands – To adopt land legislation – To make operational the national and regional land services	Framework law on environment. Millennium Development goals (Goal 7 MDG) PRSP Rio Conventions LCD Convention	2006-2009	1,75	0,06	1,69
2. Support to the creation of an environment conducive to the development of the agricultural sector		▪ To support the activities related to the protection and the development of vulnerable sites ▪ To reinforce the institutional framework and the institutional capabilities of the operators ▪ To reinforce the chamber of agriculture in order to help transform the actual activity into a professional one	Millennium Development Goals (Goal 1 MDG) PRSP & PRGSP	2006-2009	1,59	0,08	1,51
3. Re-launch of the agricultural and agro food production		▪ To increase the productivity of food and fruit sectors ▪ To develop small processing and conservation units - To introduce new varieties which can resist the evolution of climate conditions ▪ To improve the capacity and the quality of cash crops - To use distillation techniques that consume less wood	Millennium Development goals (Goal 1 MDG) PRSP & PRGSP	2006-2009	9,44	0,04	9,40

Chart 15 : Links with the fishing sector

Programmes	Objectives	Actions	Framework	Schedule of repayment	Overall Budget (million USD)	Amount obtained (million USD)	Amount to prospect (million USD)
1. To create an environment conducive to the development of the sector	**To ensure food security and fight poverty and hunger**	▪ To reinforce the institutional and capabilities framework of the operators	Millennium Development Goals (Goal 1 MDG) PRSP & PRGSP	2006-2009	0,74	-	0,74
2. To promote fishing		▪ To improve the traditional fishing techniques ▪ To exploit deep water fisheries resources	Millennium Development Goals (Goal 1 MDG) PRSP & PRGSP	2006-2009	9,79	-	9,79
3. To improve the conservation, processing and commercialisation systems		▪ To develop means of fish conservation ▪ To promote the export of deep-sea products	Millennium Development Goals (Goal 1 MDG) PRSP & PRGSP	2006-2009	4,76	-	4,76
TOTAL					**15,29**	**-**	**15,29**

Chart 16 : Links with the infrastructures and energy sectors

Programmes	Objectives	Actions	Framework	Schedule of repayment	Overall Budget (million USD)	Amount obtained (million USD)	Amount to prospect (million USD)
To improve human housing	**To reduce housing precariousness , to increase the access of the poor to a more decent housing**	▪ To promote local construction materials ▪ Training in the use of local materials and popularisation	-MDG (Goal 7) -PRSP–PRGSP -Evaluation of the needs in the transfer of technologies		2,00		2,00
To improve roads infrastructures	**To reinforce road protection and to open up the agricultural areas**	▪ To open up agricultural areas ▪ To relieve urban areas ▪ To maintain and reinforce road lanes	-Agricultural strategy -PRSP – PRGSP -Moroni urban development Plan	2006-2009	42,37	9,19	33,18
To built and standardise port and airport infrastructures	**To reinforce ports and airports protection and security**	▪ To develop, reinforce and secure ports and airports	-Donors' Conference on the Comoros – December 2005 -Convention on climate change -Assessment of the needs in technologies transfer	2006-2009	40,89	15,74	25,14
To reinforce energy infrastructures for production and transport	**To ensure a regular supply in energy at a low coast**	▪ To protect power and hydraulic plants ▪ Extension, reinforcement and improvement of transport networks ▪ To promote renewable energies ▪ To develop actions for energy control	-PRSP – PRGSP -Energetic strategic MDG (Goal 7) -Convention on climate change -Assessment of the needs in technologies transfer		4,00	27,54	4,00
TOTAL					**116,80**	**28,93**	**87,86**

Chart17 : Links with the civil security sector

Programme	Objectives	Actions	Framework	Schedule of repayment	Overall Budget (million USD)	Amount obtained (million USD)	Amount to prospect (million USD)
Prevention and disaster management	**To reduce the negative impacts of disasters and ensure the security of people and goods**	▪ To reinforce the institutional framework ▪ To set up operational structures ▪ To elaborate specific intervention plan for each kind of disaster ▪ To set up an early warning system and a communication plan for public awareness	MDG	2006-2009	**3,71**	**-**	**3,71**
TOTAL					**3,71**	**-**	**3,71**

Chart 18 : Links with the tourism sector

Programmes	Objectives	Actions	Framework	Schedule of repayment	Overall Budget (million USD)	Amount obtained (million USD)	Amount to prospect (million USD)
Support to the promotion of tourism	**To reduce poverty**	▪ To promote the creation of an eco tourism Promotion **relay** ▪ To rehabilitate and protect cultural monuments ▪ Sustainable development and promotion of the Mohéli marine park ▪ Creation of other centres of attraction for tourists ▪ To develop hiking paths ▪ To protect tourist sites against degradation and pollutions	MDG Tourism national policy PRSP Environmental Action Plan Ramsar Convention Convention on Biodiversity Convention on the fight against desertification	2006-2009	**4,17**	**-**	**4,17**
TOTAL					**4,17**	**-**	**4,17**

14.NAPA'S AIM

NAPA aims at identifying the urgent and immediate needs of adaptation to climate change by indicating the priority activities.

15.NAPA'S OBJECTIVE

NAPA's objective is to reduce the adverse effects of climate change on the means of subsistence of the people and the most vulnerable areas thus increasing their ability to resist to the modification and climate variability.

16 NAPA'S IMPLEMENTATION STRATEGY

NAPA'S implementation is placed under the direct responsibility of a pilot committee, which will be set up at the level of each island, under the supervision of the Ministry of Environment of the island. This committee will have representatives from:

1- Vulnerable groups,
2- NAPA island committee,
3- PRSP Guidance committee from each island,
4- Institutions in charge of the development of the island,
5- Associations,
6- The civil society,
7- The private sector,
8- Experts who have conducted participative evaluations on vulnerability.

This is the kind of mechanism applied in the implementation of projects funded by the Fund For the Support to Community Development (FSCD) with encouraging results. Training in the management of community development has been offered to the communities in order to increase their intervention ability.

At the national level, the coordination will be ensured by the national commission on adaptation to climate change, under the supervision of the Ministry of State in charge of Environment.

17. OBSTACLES TO THE IMPLEMENTATION OF NAPA

1- Limited knowledge of the communities and development stakeholders in terms of climate change;
2- Unpredictability of climate change effects;
3- Solidity of the adaptation measures advocated in the face of possible evolution scenarios;
4- Institutional weaknesses;
5- Possible difficulties in obtaining the necessary financial resources for the implementation of NAPA;
6- Dominating concern about the daily life of the particularly vulnerable populations.

18. MEASURES UNDERTAKEN TO FACE CLIMATE CHANGE AND CLIMATE VARIABILIY

Strictly speaking, there is not yet a real policy on climate change. However a strategy for the diversification of energy sources is being elaborated, as well as several adaptation actions in different fields and mainly in:

1. **The support project to the agricultural strategy (1991-1997)**. This project has been achieved in collaboration with the communities and the technical **assistants**, (i) adaptation researches on the agricultural intensification (ii) the fight against erosion, (iii) the restoration of the fertility of cultivated soils, (iv) agro forestry and market gardening;

2. **The pilot project of the agricultural services (2000 – 2003)**, which has achieved among other actions, the construction of tanks and harnessing to satisfy agriculture water needs.

3. **World Food Programme and the French Development Agency** (1990 – 1998) achieved a forestations and development of anti erosion works;

4. **From 1980 – 1990, the State achieved with the support of its partners to development the forestations of 1759 acres on all the islands;**

5. **The project on the « development of the growing of corn and associate crops**. This project has contributed to the development of the growing of corn and sweet potatoes through the introduction of new varieties that resist to the water-related deficit;

6. **The project « Development of food crops and support to seeds men » (1997 – 2002).** This project articulates around three general objectives:

   (i) To ensure the intensification of a national food production compatible with a sustainable management of the natural resources;

   (ii) To increase the nutritional level of the populations, both in quantity and quality;

   (iii)To reduce the level of dependence towards imports;

   The main achievements are:

   a) The construction of storage-tanks to meet the water needs of the villages and the agricultural areas,
   b) The fight against the proliferation of the cercosporiosis disease **(***Cercosporella Fugiensis***)** through the selection of more than 119.700 local banana trees shoots and 13.000 vitro plants and a reinforced maintenance of the banana fields. These operations have allowed to limit drought effects and, have resulted in the increase of crops from 57.600 tons in 1997 to 58.900 tons in 1998 and 59.000 tons in 1999.
   Regarding the other food crops, 12.800 small yam bulb, 31.120 cassava cuttings, 76.000 sweet potatoes liana and 80.000 taro plants have been delivered to the producers.
   As part of the promotion of food crops, a Support Fund amounting to 168 millions Comorian francs (480.000 USD) has been created by the micro finance institutions.
   Regarding coconut tree disease (*Aleurotrachelus atratus*), the varieties that resist to the disease have been selected in order to renew the plantations and to eliminate the affected coconut trees. In the entire country, and with regard to the two selected varieties, more than 18.300 coconut plants have been put in seed tray and only 2.127 plants were sold in 2003, e.g. 12%. This low result can be explained by the reluctance of the farmers to buy the plants, due to the current phytosanitary situation and the price set to 750 cf per piece (2 USD), which is considered to be expensive. A biological strategy fight was led with the support of the Centre for International Cooperation and Research (CIRAD-CP). The project is looking for funding to implement the biological treatment.

7. **EAF/5 – PNUE project (1995 – 1998)** has worked out a strategy for a planning and an integrated management of the coastal zone of Grand-Comoro;

8. **The Regional Environment Project of the Indian Ocean Commission (1995 – 2000)**: this project has laid the foundations for an integrated management of the coastal zone and elaborated a regional policy for sustainable development;

9. **Draft forest law submitted for** approval **and adoption by the National Assembly**;

10. **Order n° 01-50/MPE/MEC of 12/10/2001** on the regulation of the import of substances that weaken the ozone layer (SAO) ;

11. **Implementation of the plan on the management of the frigorigen fluids, which aims at eliminating SAO in a definitive way, by 2010**;

12. **Project on the development of traditional fishing between 1994 and 1995,** by equipping small boats with engines, the introduction of fish concentration mechanisms (FCM) in order to reduce the pressure exerted by fishing on the coast and training to fishing techniques;

13. **Order n° 05**-67/MFB/CAB of August 02nd, 2005 on the application of a reduced rate to the import of agricultural products;

14. **Decree n° 03-84/PR on the creation, organisation and functioning of the Fisheries development fund;**

15. **Regional project on the follow-up, monitoring and surveillance of big pelagic**;

16. **National programme on the security of the fishermen at sea**;

17. **National project on the fight against malaria (PNLP)** : to support this project funded by « Global Fund », the Comoros has tax-exempted the mosquito nets and the insecticides as well as all the medicines ;

18. **Conservation project on biodiversity and sustainable development** with the creation of the first protected marine park of an area of 404 sq ;

19. Since the 60s, efforts have been undertaken in terms of water adduction, particularly in Mohéli and Anjouan in the big agglomerations;

20. Around the 80s, an investment programme was devoted, in Grand Comoro, to the search, the valorisation and the exploitation of water resources. This programme has allowed the exploitation of 24 wells, which present a low salinity rate below 3g/l spread on the entire coastal zone of the island. However, the evaluations made in 1997 have revealed that 51% of these wells can't be exploited and 31% present faults related to pumping and sewage equipments;

21. During the 90s, the achievements made in terms of water by the village communities with the support of the World Bank through the Fund for the Support of Community Development (FADC), and the French Development Agency (AFD) and NGOs;

22. In 2001, the government concluded multi donors' programme, infrastructures, water and environment.

23. In 2003, the State redirected the project towards a unique objective: the rehabilitation and the extension of the water supply system in Anjouan and Mohéli, in order to reduce water shortage;

24. Between 2000 and 2004, SFCD, Emergency Credit for Economic Reactivation (CURE) and the several years European Union Programme on micro realisations (UE) funded 35 water laying-on ;

25. The construction of levies to protect roads or villages, by the Fund to Support Community Development and other funding sources.

19. CENSUS OF THE ADAPTATION OPTIONS

19.1. Criteria related to the selection of adaptation options

The participative evaluations of the vulnerability and adaptation as well as the public investigation made towards a sample of 1000 persons, from all the social categories, on the entire national territory provided the outcome expressed in the following chart, regarding the most vulnerable sectors:

Chart 19 : **Outcome of the investigation on the most vulnerable sectors to climate change**

Sectors	**% of the population**
Agriculture	26,19%
Water	24,76%
Health	13,10%
Trade	12,38%
Energy	10,48%
Forest	7,14%
Fishing	5,95%
Total	**100%**

It is on the basis of this survey that these sectors have been accepted. All the set actions involve these sectors and meet the needs related to climate variability.
The search for synergy between the Rio conventions, the Environmental Action Plan (PAE) and the development policies and programmes is particularly of interest in the proposed actions for NAPA's articulation, with the objectives of the national priorities, the commitments and obligations of international significance.

But considering the limited funding possibilities and the inadequacy of local implementation capabilities, a choice of priority actions has been made on the basis of: (i) likely threats linked to climate change, (ii) the level of risk, (iii) the urgency, (iv) the links with the national development programmes particularly the poverty reduction strategy and (v) synergies with multilateral agreements as well as the cost/efficiency ratio.

Based on these criteria, the priority actions were ratified by the vulnerable groups during decentralised workshops.

These priorities correspond to the activities, the delay of which in their implementation can exacerbate the vulnerability and generate negative impacts on the means of subsistence, agriculture and fishing, the water resources, housing and health, human life, forest and the associated biodiversity, etc.

19.2. Ranking of the adaptation options

The analysis of the degree of the negative impact of each risk of climate change identified on the keys sectors allowed not only the selection of priority adaptation options, but also the move to the first ranking of these options according to the indicator of exposition of the sectors. The adaptation options have been chosen on the basis of their contribution to reduce poverty, to food security, to mitigate the negative impacts on the sectors that public surveys indicate as most vulnerable, as well as their links to the ongoing programmes projected for the short term.

Chart 20 : Evaluation of the criteria and 1st Ranking of the options according to the exposition indicators

Priority Adaptation Option	Vulnerable Sectors					Vulnerable Groups				Criteria			
	Agriculture	Fishing	Health	Infrastructure	Farming	Small farmers	Workers informal sector	Fishermen	Cattle	Costs in (millions USD)	Contribution to food security (1 – 5)	Poverty reduction (%)	AME (1 – 10)
Varieties that are most adapted to drought	+	X	+	X	+	+	+	+	+	0,420	4	40	2
Defence and Restoration of degraded soils	+	+	+	X	+	+	X	+	+	0,5	5	40	8
Reconstitution of basin slopes	+	+	+	+	+	+	+	+	+	0,580	5	30	7
Increase in water supply	+	X	+	X	+	+	+	+	+	0,95	5	20	2
Improvement of water quality	+	X	+	X	+	+	+	+	+	0,080	5	20	1
Fight against malaria	X	X	+	X	X	+	+	+	+	0,175	3	30	1
Local non metallic construction materials	X	X	+	+	X	+	+	+	+	1,025	2	40	3
Fodder production for pour goats	+	X	+	X	+	+	+	X	+	0,1	4	40	1
Provender production	+	X	+	X	+	+	+	+	+	0,090	4	30	2
Introduction of FCM	X	+	+	X	+	+	+	+	X	0,132	4	60	2
Fish Conservation under ice	X	+	+	X	X	+	+	+	+	0,308	5	50	3
Early warning	+	+	+	X	+	+	+	+	+	0,075	3	10	2
Support to eye medical care and surgery	X	X	+	X	X	+	+	+	+	0,122	1	12	1
TOTAL COST OF THE OPTIONS										**3,702**			

Remarks: positive Impact = + ; no impact = X
Criteria : 1 = very low, 5 = very high

19.3. Prioritisation of the adaptation options

The outcomes of the participative evaluations and the public surveys conducted have allowed to determine the climate risks, the sectors and the groups of populations that are particularly vulnerable, as well as the priority adaptation options. The criteria are ranked by priority order in relation to the needs generated by the climate risks and the national context.

19.3.1. Methodology

The multi criteria analysis has been used, in order to highly specify the order of priority in the ranking of the options. This method includes variables as well as non-monetary and qualitative indicators resulting from inadequacy, indeed lack of data. It furthermore includes other methods of analysis cost/profits and cost/efficiency. It finally takes into consideration the economic and financial situation of the country. During a workshop, the participants selected the criteria to be accepted on the basis of the participative evaluations made on the vulnerability and the economic and social context of the country. Then according to a given scale, the direction of the graduation scale takes into consideration the increasing values for the advantages and the decreasing ones for the disadvantages (costs).

The criteria marks are expressed in different units and on different scales (following chart), therefore, they cannot be compared

.

Chart 21 : Initial evaluation of the criteria per marking

Priority adaptation options	Criteria			
	Costs in (millions USD)	Contribution to food security (1 – 5)	Poverty reduction (%)	AME (1 – 10)
Varieties that are more adapted to drought	0,420	4	40	2
Defence and Restoration of degraded soils	0,5	5	40	8
Reconstitution of basin slopes	0,580	5	30	7
Increasing water supply	0,95	5	20	2
Improving water quality	0,080	5	20	1
Fight against malaria	0,175	3	30	1
Local non metallic construction materials	1,025	2	40	3
Fodder production pour goats	0,1	4	40	1
Provender production	0,090	4	30	2
FCM Introduction	0,132	4	60	2
Fish Conservation under ice	0,308	5	50	3
Early warning	0,075	3	10	2
Support to eye medical care and surgery	0,122	1	12	1
TOTAL COST OF THE OPTIONS	**3,702**			

a) Standardisation – The criteria have the same importance: 1st level of prioritisation

Standardisation allows to express the criteria marks in a common unit, a common scale by applying the following formula:

$1 - \frac{(H - x_i)}{H - L}$ H being the highest value, L, the lowest and xi, the option.

For the costs, standardisation is given by the formula: $1 - \frac{(L - x_i)}{L - H}$

For instance, for the option «***Varieties that are more adapted to drought*** » and the criteria « ***cost***»

- The highest value H = 1,025
- The lowest value L = 0,075
- The value of the option = 0,420

The standardised mark of the cost criteria for the option is: 1 – [(0,075-0,420) / (0,075-1,025)] = **0,64**

An average is calculated for each option by adding, Σx_i, of the marks in all the criteria, divided by the number of criteria n_i. The ranking order of the options depends on the average obtained for each option. In terms of priority, the higher the average, the higher the option.

For instance, for the option «Varieties that are more adapted to drought», the average is : (0,64+0,75+0,60+0,14)/4 = **0,53**.

Following the standardisation, all the marks of the different criteria are expressed in the same unit on a same scale (0 to 1).

Chart 22 : standardised marks and initial options ranking

#	OPTIONS	Criteria				average (Σxi/ni)	1st ranking
		Costs	Contribution food security	Poverty reduction	AME		
1	Varieties that better resist drought	0,64	0,75	0,60	0,14	0,53	**8**
2	Defence and Restoration of degraded soils	0,55	1,00	0,60	1,00	0,79	**1**
3	Reconstitution of basin slopes	0,47	1,00	0,40	0,86	0,68	**4**
4	Increase of water supply	0,08	1,00	0,20	0,14	0,36	**11**
5	Improvement of water quality	0,99	1,00	0,20	-	0,55	**7**
6	Fight against malaria	0,89	0,50	0,40	-	0,45	**9**
7	Local non-metallic construction materials	-	0,25	0,60	0,29	0,28	**12**
8	Fodder production	0,97	0,75	0,60	-	0,58	**5**
9	Provender production	0,98	0,75	0,40	0,14	0,57	**6**
10	FCM Introduction	0,94	0,75	1,00	0,14	0,71	**2/3**
11	Conservation of fish under ice	0,75	1,00	0,80	0,29	0,71	**2/3**
12	Early warning	1,00	0,50	-	0,14	0,41	**10**
13	Support to eye medical care and surgery	0,95	-	0,04	-	0,25	**13**

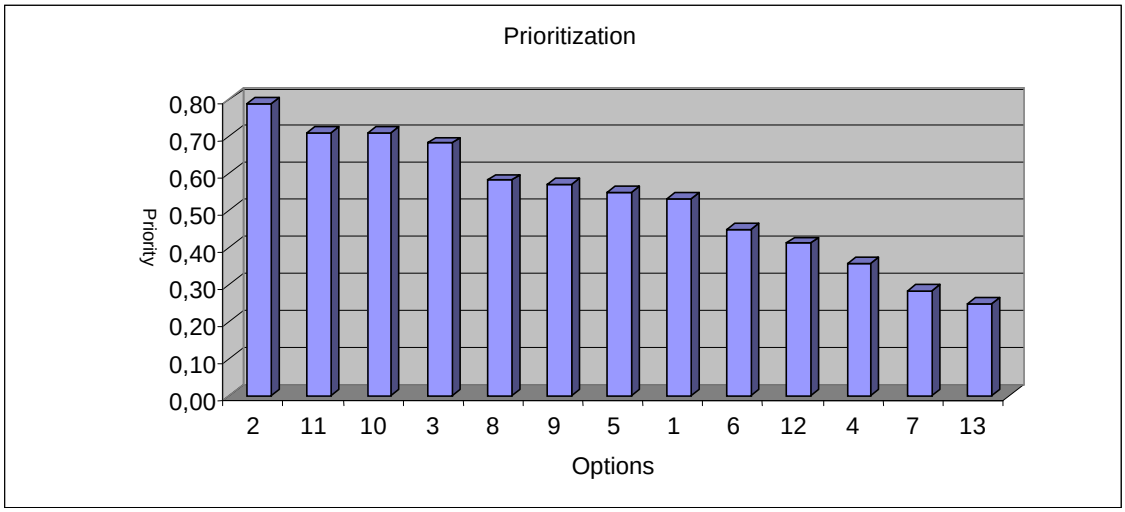


Fig. 18 : Histogram of the 1st ranking

Following standardisation, the three options 4, 7 and 13, which came in the last position in the ranking, could have been discarded before the beginning of the balancing of criteria. But they were kept because they have been selected on the basis of the outcome of the participative evaluations and the consultations in response to the real adaptation needs. This first ranking puts soils defence and restoration as first priority followed by the conservation of fish under ice, introduction and the reconstitution of basin slopes. These four priorities involve agriculture and fishing, considered as key sectors for poverty reduction and food security. These priorities are therefore in line with the importance given to these criteria by the population during these decentralised workshops.

b) Prioritisation with balancing of criteria

In this second level of prioritisation, the criteria do not have the same importance. The weight criterion is assessed from a survey during workshops. The marks given to each criterion by the participants give more importance to poverty reduction and food security than the cost and synergy with the MEA as indicated by the outcomes in the following chart.

Chart 23 : Ranking of the criteria by order of importance

Criteria	Weight of the criteria	Ranking
Poverty reduction	4.8	1
Contribution to food security	4.4	2
Synergy with the AME	2.8	3
Cost	2.1	4

Chart 24 : (1) Balancing of poverty reduction

#	OPTIONS	Costs	Contribution to food security	Poverty reduction	AME	Balanced average	2nd Ranking
	Absolute balancing	1	1	3	1	Σ = 6	
	Relative balancing	0,166	0,166	0,5	0,166		
1	Varieties that better resist drought	0,64	0,75	0,60	0,14	0,55	**6**
2	Defence and Restoration of degraded soils	0,55	1,00	0,60	1,00	0,73	**3**
3	Reconstitution of basin slopes	0,47	1,00	0,40	0,86	0,59	**4**
4	Increase in water supply	0,08	1,00	0,20	0,14	0,30	**11**
5	Improvement of water quality	0,99	1,00	0,20	-	0,43	**8/9**
6	Fight against malaria	0,89	0,50	0,40	-	0,43	**8/9**
7	Local non-metallic construction materials	-	0,25	0,60	0,29	0,39	**10**
8	Fodder production	0,97	0,75	0,60	-	0,59	**5**
9	Provender production	0,98	0,75	0,40	0,14	0,51	**7**
10	Introduction of FCM	0,94	0,75	1,00	0,14	0,81	**1**
11	Conservation of fish under ice	0,75	1,00	0,80	0,29	0,74	**2**
12	Early warning	1,00	0,50	-	0,14	0,27	**12**
13	Support to eye medical care and surgery	0,95	-	0,04	-	0,18	**13**

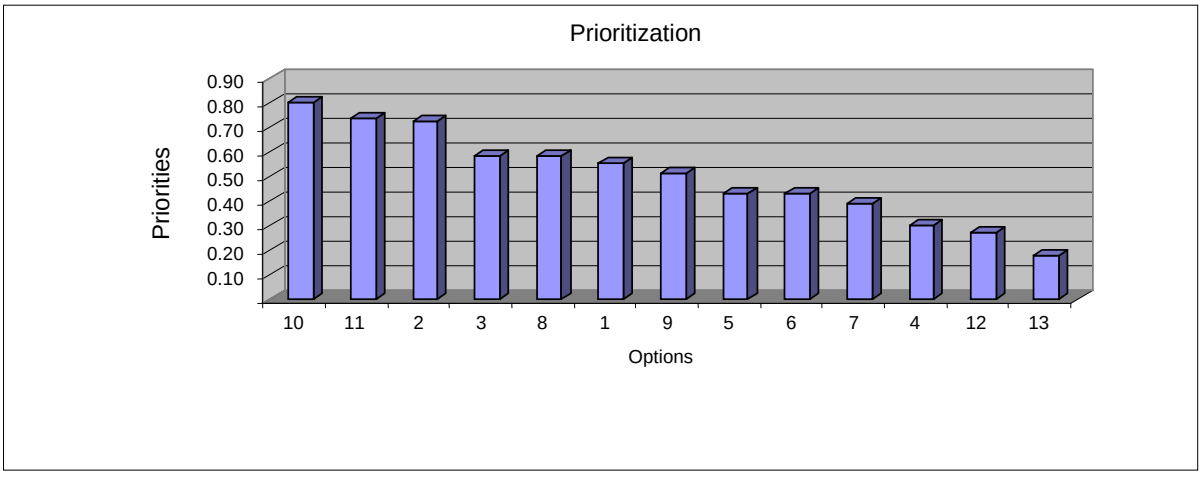


Fig.19 Histogram of the 2nd ranking

This second ranking puts ahead the same four priorities seen earlier: the setting-up of FCM, fish conservation, the defence and restoration of degraded soils and the reconstitution of basin slopes. These four priorities are also in line with the importance given to poverty reduction and food security.

Chart 25: (2) Poverty reduction and Contribution to food security are balanced respectively to 3 and to 2.

#	OPTIONS	Costs	Contribution to food security	Poverty reduction	AME	Balanced average	3rd ranking
	Absolute balancing	1	2	3	1	Σ = 7	
	Relative balancing	0,143	0,286	0,429	0,143		
1	Varieties that better resist drought	0,64	0,75	0,60	0,14	0,58	6
2	Restoration of degraded soils	0,55	1,00	0,60	1,00	0,76	3
3	Reconstitution of basin slopes	0,47	1,00	0,40	0,86	0,65	4
4	Increase of water supply	0,08	1,00	0,20	0,14	0,40	10
5	Improvement of water quality	0,99	1,00	0,20	-	0,51	8/9
6	Fight against malaria	0,89	0,50	0,40	-	0,44	8/9
7	No-metallic local construction materials	-	0,25	0,60	0,29	0,37	11
8	Fodder production	0,97	0,75	0,60	-	0,61	5
9	Provender production	0,98	0,75	0,40	0,14	0,55	7
10	Introduction of FCM	0,94	0,75	1,00	0,14	0,80	1
11	Fish conservation under ice	0,75	1,00	0,80	0,29	0,78	2
12	Early warning	1,00	0,50	-	0,14	0,31	12
13	Support to eye care and surgery	0,95	-	0,04	-	0,15	13

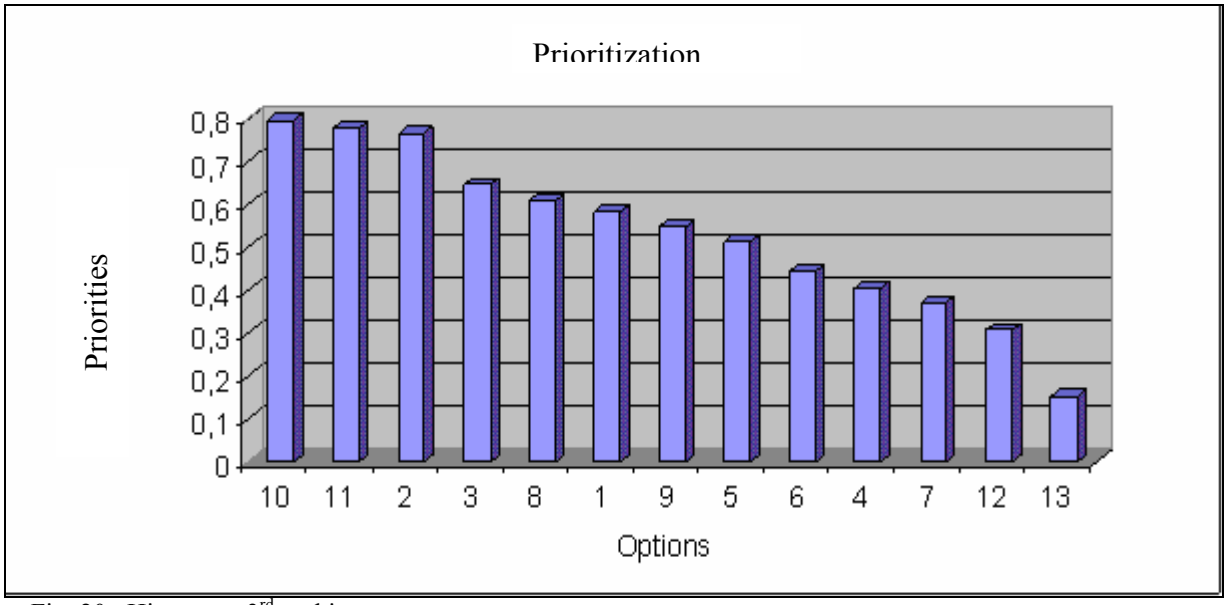


Fig. 20 : Histogram 3rd ranking

This third level of prioritisation puts as priorities the same options as those the second level of prioritisation.

Chart 26 : Prioritisation of the options from consultations, per island, and at the national level.

		GRADES				RANK			
#	OPTIONS	Mohéli	Anjouan	Grand Comoro	Country	Mohéli	Anjouan	Grand Comoro	Pays
1	Varieties that better resist drought	303	89	91	**483**	2	1	2	**1**
2	Defence and soil restoration	356	143	103	**602**	5	2	4	**4**
3	Reconstitution of basin slopes	360	194	146	**700**	6	5	6	**6**
4	Increase of water supply	338	154	74	**566**	4	3	1	**2**
5	Improvement of water quality	312	186	101	**599**	3	4	3	**3**
6	Fight against malaria	280	224	105	**609**	1	6	5	**5**
7	Non-metallic local construction material	500	304	188	**992**	11	7	10	**7**
8	Fodder production	553	353	188	**1094**	13	8	11	**13**
9	Provender production	521	399	173	**1093**	12	12	9	**12**
10	Introduction of FCM	403	394	203	**1000**	7	11	13	**9**
11	Fish conservation under ice	448	420	159	**1027**	9	13	7	**11**
12	Early warning	455	376	169	**1000**	10	9	8	**8**
13	Support to eye care and surgery	443	378	191	**1012**	8	10	12	**10**

In these exercises, the adopted principle consists in giving a mark between 1 and 13 to each option. The more the option is considered as a priority, the lower its mark is. For each option, the total of the obtained marks determines the order of priority of the option. This is how the order of priority has been obtained for each island. At the national level, the order of priority of an option is obtained by adding the obtained marks in each island for this option according to the same principle.

19.3.2. Analysis of the outcomes

Following the balancing of poverty reduction alone and the simultaneous balancing of the criteria that are deemed important, the order of the first four priorities remains the same. They are: the setting-up of FCM, fish conservation, the restoration of degraded soils and the reconstitution of basin slopes. The two criteria well translate the interest that the population place in poverty reduction. Regarding standardisation, the first four priorities also remain the same, but the order of priority changes. The priorities arising from the importance given to by the population to poverty reduction and food security. The options 10, 11, 2 and 3 remain the four priority options in all the cases.

However, this order of priority differs from the one expressed by each of the islands as well as the one obtained at the national level. In these conditions, it is advisable to remember the order of priority expressed in each island. Indeed, each island presents ecological specificities and a different economic and social context and therefore different priorities. These priorities also meet the concerns related to poverty reduction and food security. The below chart presents the outcomes obtained during decentralised workshops.

20. COORDINATION FOR ADAPTATION

The experienced obtained during the elaboration of NAPA shows that:

a) The foreseen strategies in the face of climate are inter- sectoral;
b) Some national plans that meet the obligations of the conventions could contribute to poverty reduction.

It is therefore necessary to integrate the adaptation and to take into account the strategies of these plans of actions, as part of a broader development. This takes the availability of an institutional mechanism and the mobilisation of the involved stakeholders within the national development scheme However until

now, the issues related to climate change and environment in general, are under the responsibility of the Ministry of State, in charge of Environment who lacks the human and financial means and the necessary influence to engage the necessary sectoral reforms, because of the lack of support through an inter-sectoral coordination mechanism.

In order to fill this gap, it was suggested to set up a national commission for adaptation to climate change (CNAC) in order to maintain the good growth perspectives and ensure macro economic stability. In spite of this requirement and the readiness to take into account the Multilateral Environment Agreements, in the process for development planning, the inadequacy of the technical capabilities and the lack of financial means can limit the efficiency of this move.

To ensure a successful and efficient implementation of NAPA, and facilitate the integration of climate change in the process for national planning, it is necessary to carry out support activities particularly in the following sectors:

1) Public information and education on climate risks;
2) Capacity-building of:
    a. Medias, civil society and associations for education on climate change;
    b. Development stakeholders for the planning and the integration of the climate dimension in the development policies;
    c. Research Institutes to allow them to carry out works on climate change;
3) Updating of the cadastre and reform of the judicial framework;
4) Setting-up of a database on climate parameters;
5) Support to the social and economic database, particularly the computerisation of the social and economic maps of the Commissariat General for Planning.

20.1. Composition of the Commission:

Under the supervision of the Ministry of State in charge of Environment, the commission will be composed of:

1. The Ministry of Finance and Budget,
2. The Ministry of State in charge of Economy and Trade,
3. The Ministry of State in charge of Planning, Homeland Development and Urbanism,
4. The Ministry of Health,
5. The Focal points of the les Conventions,
6. The National Assembly,
7. The National Research Institute for Agriculture, Fisheries and Environment,
8. The civil society,
9. The private sector,
10. The associations,
11. The University of the Comoros,
12. The National Centre for Documentation and Scientific Research (NCDSR).

The aim of the commission is to see that climate change is taken into account in the development programmes through inter-sectoral coordination. The Ministry in charge of Environment will deal with the secretariat work of the Commission. The development projects will be sent to the commission for study, by the Ministries that foster growth, via the Ministry of Environment.

20.2. Communication strategy for adaptation

The coordination of the adaptation must be supported by a communication strategy based on the available data related to current and the future climate variability. This communication will address the climate issue in the angle of the means of existence, by explaining, in a concrete way, the way climate change increases the vulnerability of the poor by threatening their health and their economic perspectives. In this spirit, it will be necessary to improve the efficiency of the communication through the coordination of all the initiatives for the gathering and spreading of data. This move should allow to clarify and guide the decisions and public action.

21. NAPA ELABORATION PROCESS

1. The Ministry of State in charge of the Environment submitted to the Council of Ministers of the Union, a note of information on the specific objectives of the National Action Programme on Adaptation, the move to be followed and the need to mobilise the population to support this process;

2. On proposal of the Directorate in charge of Environment, the Ministry of State appointed the National Coordinator of the NAPA project;

3. A national multi disciplinary and inter-sectoral committee was set up. It is composed of the civil society, associations, the private sector, the national administration, the National Assembly and the University of the Comoros;

4. Each of the Ministries of the Autonomous Islands in charge of Environment set up a NAPA island committee, which is also multidisciplinary and inter-sectoral, to coordinate the process at the island level;

5. Each NAPA island committee suggested to the national committee a list of thematic experts with a CV to support it;

6. The national NAPA committee studied CVs and proceeded to the selection of experts for the carrying out of the vulnerability and adaptation studies, on the basis of the marks given to each proposed candidate;

7. Specialists in communication have also been selected to sensitise the public on the stakes related to climate change in order to justify the validity of NAPA and encourage the support of the population to the engaged process;

8. A first workshop was held in each of the three islands with the participation of the vulnerable groups, the private sector, the associations and the administration;

9. A national workshop was held to mark the official launch of the process with the participation of the same stakeholders;

10. A public survey was conducted in the three islands, in parallel with the participative evaluations in order to complete them and increase the sensitisation, information and largest participation of the population, particularly concerning the immediate and urgent adaptation activities;

11. The synthesis of the sectoral studies was made and submitted for study and approval, through a national workshop chaired by the Minister of State in charge of Environment. During this workshop, the implementation strategy of NAPA and the adaptation strategy were also discussed;

12. From this workshop, the outcome of the participative evaluations and the adaptation measures were subjected to a large broadcast on the national and the rural and private radios. The populations, the members of NAPA committee, executives from different horizons also gave

interviews to justify the validity of NAPA and explain the coherence of the outcome of the evaluations as well as the adaptation measures proposed with relation to the situation;

13. A national workshop on the choice of the criteria for the selection of options and priority adaptation activities was held with the involvement of the vulnerable groups and the trade unions from different sectors of activities;

14. Decentralised workshops were held to evaluate the weight of the accepted criteria, their ranking by order of importance as well as the organisation into hierarchies of the identified priorities, on the basis of a questionnaire submitted namely to the vulnerable groups. These workshops also studied the vulnerability maps and the areas where the projects have been allocated, in order to make sure that all of them reflect the content and the coherence of the vulnerability evaluations of the different consultations and field realities;

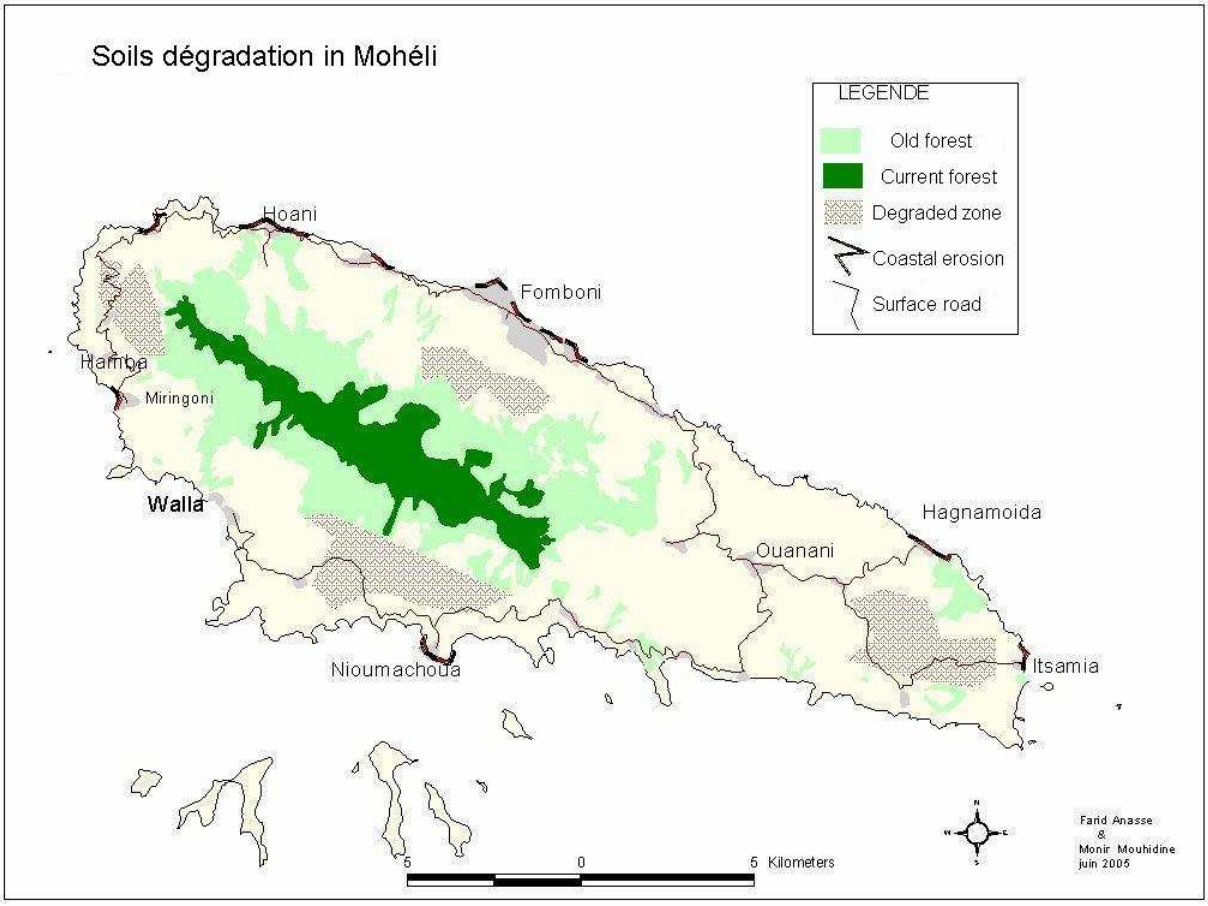
15. A national committee gathering the civil society, the associations, the research institutions and those in charge of development and education issues, those in charge of information, communication and the representatives of the National Assembly have been identified for the review of the NAPA document;

16. A national workshop gathering the elected, the representatives of government, the diplomatic corps, representative from the civil society and the associations has been devoted to the study and the ratification of the NAPA document;

17. The translation of the NAPA document into the different local dialects has not been accepted as a popularisation option due to the high level of illiteracy (43,5%). The translation of the documents « Population, Development and HIV-AIDS » in the different dialects did not bring encouraging outcome. NAPA committee has therefore chosen to popularise the document through Medias and to therefore comply with the oral tradition of the Comorians. It however envisages publishing leaflets for schools and the learned people.

22. ATTACHMENTS

22.1. ATTACHMENT A: VULNERABILITY MAP


Soils dégradation in Mohéli
LEGENDE
Old forest
Current forest
Degraded zone
Coastal erosion
Surface road
Hoani
Fomboni
Hamba
Miringoni
Walla
Hagnamoida
Ouanani
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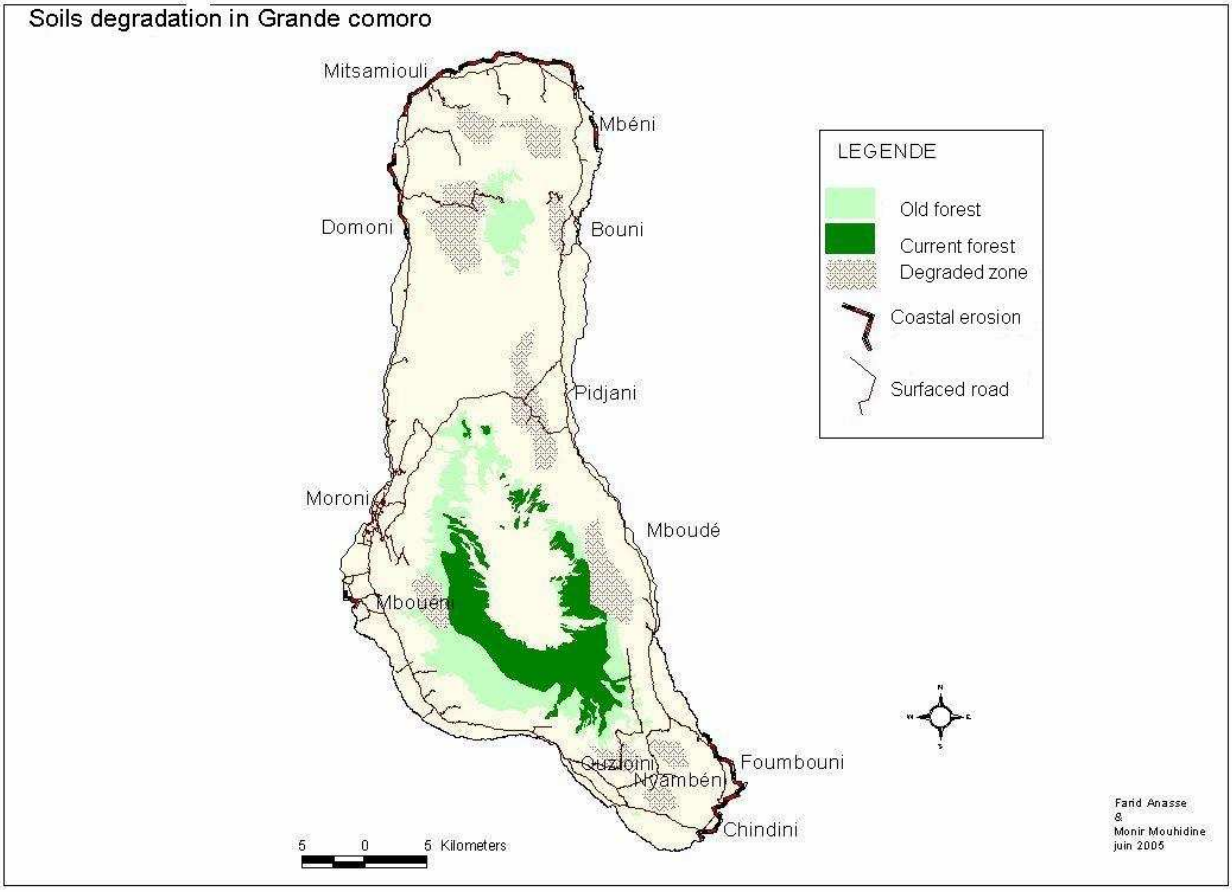
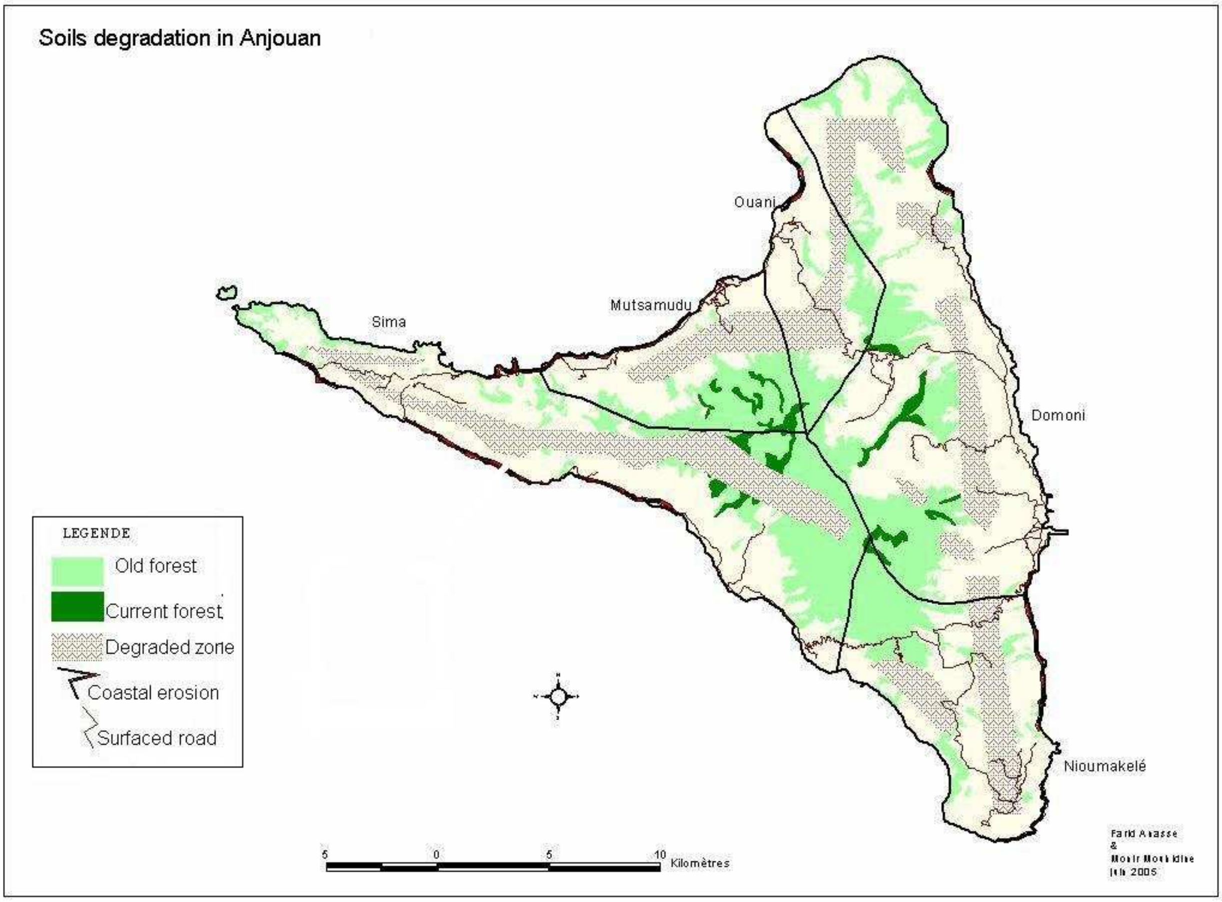
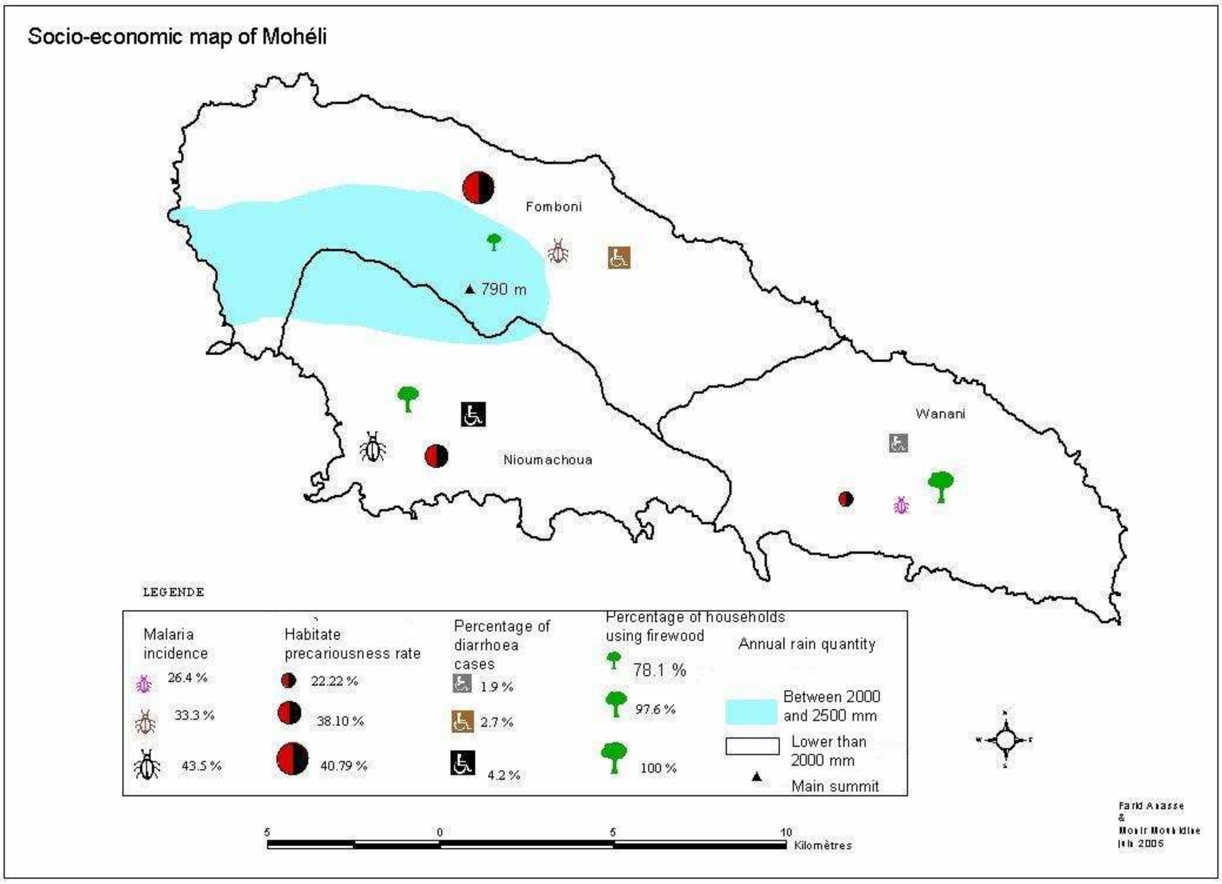
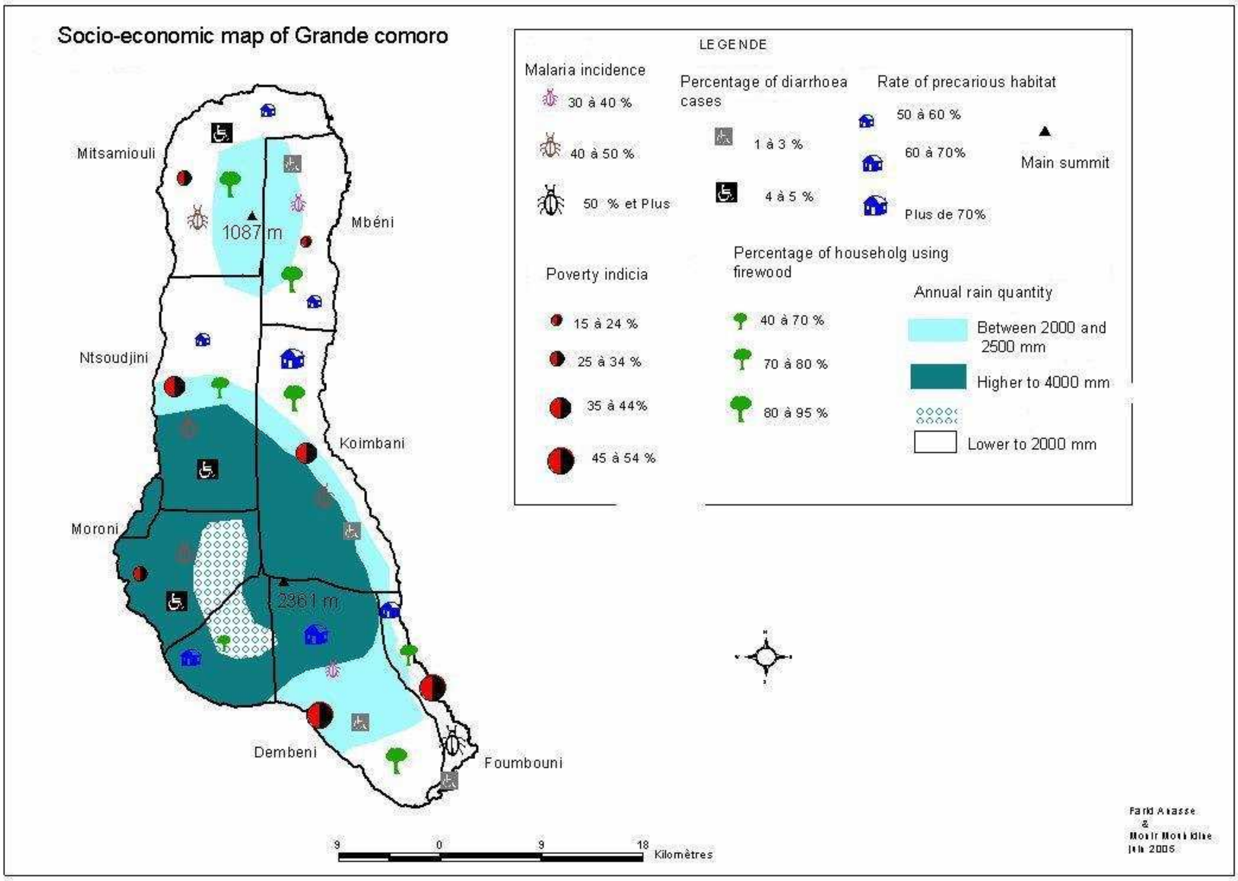
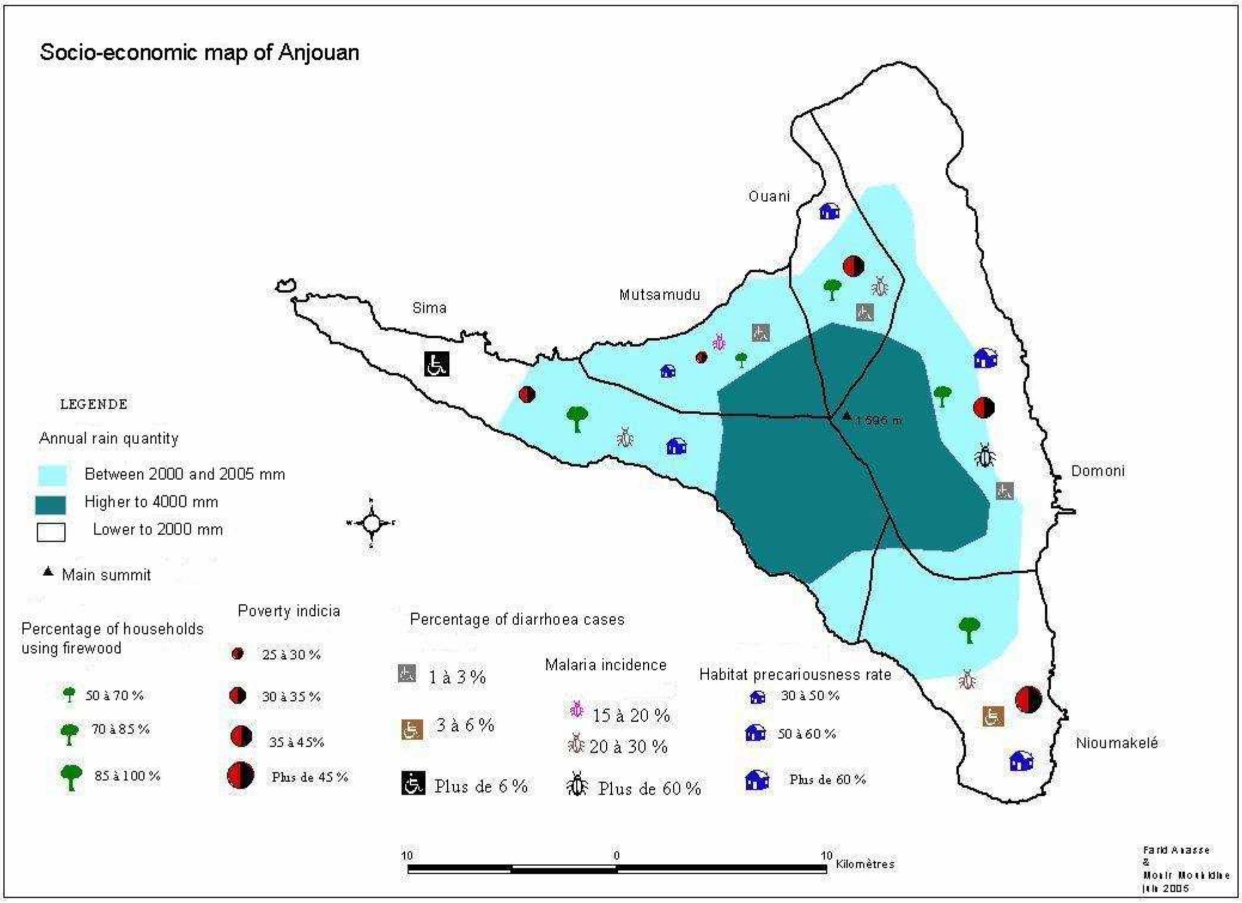
Monir Mouhidine
juin 2005


Soils degradation in Grande comoro
Mitsamiouli
Mbéni
Domoni
Bouni
Pidjani
Moroni
Mboudé
Mbouéni
Foumbouni
Nyambéni
Chindini
LEGENDE
Old forest
Current forest
Degraded zone
Coastal erosion
Surfaced road
5 0 5 Kilometers
Farid Anasse
&
Monir Mouhidine
juin 2005


Soils degradation in Anjouan
Ouani
Mutsamudu
Sima
Domoni
Nioumakelé
LEGENDE
Old forest
Current forest
Degraded zone
Coastal erosion
Surfaced road
5 0 5 10 Kilomètres


Socio-economic map of Mohéli
Fomboni
790 m
Wanani
Nioumachoua
LEGENDE
Malaria incidence
26.4 %
33.3 %
43.5 %
Habitate precariousness rate
22.22 %
38.10 %
40.79 %
Percentage of diarrhoea cases
1.9 %
2.7 %
4.2 %
Percentage of households using firewood
78.1 %
97.6 %
100 %
Annual rain quantity
Between 2000 and 2500 mm
Lower than 2000 mm
Main summit
5 0 5 10 Kilomètres


Socio-economic map of Grande comoro
LEGENDE
Malaria incidence
30 à 40 %
40 à 50 %
50 % et Plus
Percentage of diarrhoea cases
1 à 3 %
4 à 5 %
Rate of precarious habitat
50 à 60 %
60 à 70%
Plus de 70%
Main summit
Poverty indicia
15 à 24 %
25 à 34 %
35 à 44%
45 à 54 %
Percentage of householg using firewood
40 à 70 %
70 à 80 %
80 à 95 %
Annual rain quantity
Between 2000 and 2500 mm
Higher to 4000 mm
Lower to 2000 mm
Mitsamiouli
Mbéni
1087 m
Ntsoudjini
Koimbani
Moroni
2361 m
Dembeni
Foumbouni
9 0 9 18 Kilomètres


Socio-economic map of Anjouan
Ouani
Sima
Mutsamudu
1 595 m
Domoni
Nioumakelé
LEGENDE
Annual rain quantity
Between 2000 and 2005 mm
Higher to 4000 mm
Lower to 2000 mm
Main summit
Percentage of households using firewood
50 à 70 %
70 à 85 %
85 à 100 %
Poverty indicia
25 à 30 %
30 à 35 %
35 à 45%
Plus de 45 %
Percentage of diarrhoea cases
1 à 3 %
3 à 6 %
Plus de 6 %
Malaria incidence
15 à 20 %
20 à 30 %
Plus de 60 %
Habitat precariousness rate
30 à 50 %
50 à 60 %
Plus de 60 %
10 0 10 Kilomètres

22.2 ATTACHMENT B: SUMMARY AND PROFILE OF THE PROJECTS

1. SUMMARY OF THE PROJECTS AND THEIR COSTS

2. PROJECTS PROFILE

Chart 27: Summary and projects costs

Title of the projects	Sheet n°	Amount (Millions USD)
Varieties that are more adapted to drought	1	0,420
Defence and Restoration of degraded soils	2	0,5
Reconstitution of basin slopes	3	0,580
Increase in water supply	4	0,095
Improvement of water quality	5	0,080
Fight against malaria	6	0,175
Use of local non metallic construction materials	7	1,025
Fodder production for goat breeding	8	0,1
Provender production	9	0,090
Introduction of FCM	10	0,132
Short conservation of fish under ice	11	0,308
Early warning	12	0,075
Support to eye medical and surgical care	13	0,122
TOTAL		**3, 702**

PROJECT SHEET

Project sheet N°1	**Sector of intervention: Agriculture** **Title of the project:** Introduction of varieties that are more adapted to drought

Zones of intervention: Hagnamoida, Itsamia, Nyoumachoua, Ndrondroni (Mohéli); Sadapoini, Magomani, Barakani, Hasinka, Bandani, Sima – Bimbini, Milimajou Hadda, Mlimajou Pangani (Anjouan) ; Didjoni – Ifoundihé, Djongwé-Zidilher, Funga – Membwadjou, Madjéwéni – Bambadjani, Sidjou-Idjinkoundzi, Mtsangadjou Pidjani (Grand-Comoro)

Links with the ongoing or projected programmes and with the Multilateral Agreements
Agricultural strategy, PRGSP (Poverty Reduction and Growth Strategy Paper)

Recipients: Small farmers and the poorest population from the rural and urban areas.

Justification:
Rises in temperatures and early and prolonged droughts lead to a reduction of food-producing crops, which remain the basis of national food and activity. Food-producing crops provide more than half of the agricultural GDP, which represents in itself 44% of the national GDP. In spite of this high percentage, local food production remains insufficient to meet domestic demand, which is constantly growing. Important quantities of cereals are imported every year to compensate for this deficit. The negative economic growth per inhabitant and the subsequent increase of poverty, combined with climate variability make difficult the access to food for the most vulnerable groups. In order to face the reduction of the production of food-producing crops and facilitate the access of the poorest to food, it is necessary to multiply at least by two, the current level of the production of food-producing crops. Considering the low extension capacity of the cultivated surface areas, this increase should normally occur mainly through the increase of the crops productivity. The introduction of varieties that are more adapted to drought will enable to reduce production decrease, indeed increase the local production level. It will also contribute to food security by reducing food shortages and imports, thus lightening commercial deficit.

Description :

The objective of the project is to ensure the production and distribution of good quality seeds and varieties of food-producing crops (sweet potato, banana, cassava, tarot, leguminous plants, etc.), which are more adapted to drought. The main activities will deal with:

- Supporting small farmers in producing and preserving seeds and varieties of food-producing crops which are more adapted to drought,
- To turn the production of seeds and more adapted varieties into a profitable economic activity.

The implementation of the project will require the following inputs:

- Seeds and varieties that are more adapted to drought;
- Multiplication parcels;
- Equipment/set of tools;
- Water and phytosanitary products;
- Seeds preservation and distribution conditions;
- Financial resources, etc.

In the short term, the aim of the project is to set-up a bank for seeds and varieties that are more adapted to drought, to train and make producers into specialists, to reduce capacity losses, to increase the production of food-producing crops and facilitate a better access to food, for the most vulnerable groups.

In the long term, the project will contribute to food security, poverty alleviation and the lightening of the commercial balance through the reduction of food imports.

Implementation:
The project will be carried out by a multisectoral pilot committee for each island under the supervision of the Environment Ministry of the island, under the national coordination of the Union Ministry in charge of Environment.

The limited technical ability of the actors, the possible delay in the mobilisation of resources, the lack of experience and the weak means of the newly set-up decentralised institutions, which will be in charge of supervising the project could constitute risks and obstacles that may limit the success of the project.

The follow-up and evaluation indicators are:

- The quantity and quality of the available seeds and more adapted varieties;
- The setting-up of a central buying office for more adapted seeds;
- The development of close-by food crops markets;
- The increase of the production of food-producing crops;
- Easier access of vulnerable groups to food.

Cost: **420 000 US $**

Project sheet No. 2	**Sector of intervention**: Agriculture **Project title:** Defence and Restoration of degraded soils (DRS)

Zones: Koki, Gege-Hachipenda, Trenani, Majindzani (Anjouan)
Kangani, Hagnamoida (Mohéli) Ndzouani-Kove, Koimbani-Nioumadzaha, Chezani (Grand-Comoro)

Links with the ongoing or envisaged programmes and with he Multilateral Agreements
Agricultural strategy, PRGSP (Poverty Reduction and Growth Strategy Paper)

Recipients
Small farmers with small pieces of land, sharecroppers and the poor from the rural areas.

Justification:
The traditional production systems which are still currently applied testify, for most of them, of the efforts made along the centuries by the Comorian peasants to adapt to the various and difficult ecologic conditions. But today, these adaptation efforts are undermined by the fluctuations of climatic conditions characterised by early and prolonged droughts, higher temperatures and accelerated soil erosions caused by sudden heavy precipitations. Out of 112000 ha of cultivable lands, 57,5 % are degraded, with 50 %, 65 % and 52 % respectively in Grand-Comoro, Anjouan and Mohéli.

The ratio of the potential of cultivable land per person is of 0,32, 0,2 and 0,6 ha, respectively for Grand-Comoro, Anjouan and Mohéli. In 1984, this ratio was respectively of 0,38, 0,25 and 1 acre.

The proportion of cultivated lands in relation with the potential is situated between 61 and 80 % in Grand-Comoro and in Mohéli and more than 90 % in Anjouan.

The search for new lands in favour of food-producing crops has led to a massive deforestation of the last forest spaces on strong to very strong slopes, over 60 to 70%.
The introduction of agriculture into the forest massifs has also led to negative impacts on biodiversity, water resources, and (durability of the surface, water flows and natural recharge of sheets of water and on the coastal ecosystems by the flattening resulting from erosion.

The defence and the restoration of degraded soils will contribute to increase the useful agricultural surface area, to fight erosion and reduce agriculture pressure on forests. This action will enable to move towards a level of improvement that includes the management of soils fertility through agro forestry and increase capacities in order to face the decrease of the production caused by climate variability. It will favour access to land for many poor peasants and the reduction of food shortages as well as monetary poverty.

Description:
The objective of the project is to restore the degraded soils, protect soils against erosion in order to increase the useful agricultural surface area and reduce land pressure and limit the introduction of agriculture into the forests.

The main activities will deal with:

- Identification of degraded soils;
- Training and organising the peasants,
- Circulation of technical package,
- Setting-up of tree nurseries;
- Staking parcels;

- Identification of rapidly growing species with high restitution of organic matter,
- Land development;
- Production, distribution, tree plantation,
- Plantation of plant hedges for multiple usage (green manure, mulch, organic manure) and stone low walls)
- Parcels fencing
- Ploughing,
- Production of fodder plants,
- Cattle-raisers association, manure and plant residue

The setting-up of the project will require the following inputs:

- Plant matter (seeds, cuttings),
- Shade nets,
- Set of tools,
- Financial resources.

In the short term, the project will enable to reduce land pressure and the access of the poorest to land, in order to limit the introduction of agriculture into the forest, through the increase of the useful agricultural surface area.

In the long term, the aim of the project is to ensure the preservation of the management of soils fertility, in order to diversify crops and increase productivity. The project will enable to reduce run-off, to increase the recharge of underground water. It will contribute to roll back poverty, increase food security and improve the access of the poorest to food.

Implementation:
The project will be carried out by a pilot multisectoral committee in each island under the supervision of the Island Minister of Environment, with the coordination of the Union Ministry in charge of Environment.

The possible delay in the adoption of the reform, the land legislation and the weak capabilities to mobilise financial resources, the technical know-how and the limited means of the newly set-up decentralised institutions which will be responsible for the supervising of the project constitute possible risks and obstacles to the success of the project.

The follow up and evaluation indicators are:

- Number of trained peasants;
- Meters of set-up quickset fences and low walls;
- Number of planted trees (and level of growth)
- Fenced surface areas;
- Surface areas reserved to crops on the degraded areas;
- Number of peasants with access to the land,
- Capacity of the main food-producing crops on the developed lands.

Cost: **500.000 USD**

Project sheet No. 3	**Sector of intervention** : Forests **Title of the project:** Reconstitution of the basin slopes

Zones: Dindrihari, Bazimini, Mirontsi, Dindri, Hamkoko, Hamazia, Région de la Cuvette (Anjouan) ; Gnoumachioi, Fomboni, Itsamia (Mohéli) ; Plateau de la grille, Gnambéni, Mkoudoussi (Grande-Comoro).

Links with the ongoing and envisaged programmes and with the Multilateral Agreements
Framework law on Environment, PRSP, sustainable management of lands in relation with CDD Plan, Water and Improvement Programme, Convention on Biological Diversity, Agricultural Strategy and Special Programme on food security.

Recipients:
Farmers and the entire population

Justification :
Over the last thirty years, t he climate of the Comoros has been characterised by instability marked by early and prolonged droughts and heavy rains.

The situation is translated by a shift of the climatic zones and constitutes a threat to the fauna and flora, some species of which are likely to disappear before being identified and listed by the botanists, as well as to the already known medicinal and aromatic species.

Heavy rains, marked dry seasons and high temperatures provoke soils cleansing, retreat cracks, clayey soils and fall of earth, which are the cause of the degradation of 65.335 ha of land e.g (57,5%) of the total agricultural area.

This level of degradation seems to indicate an advanced desertification process and forces the penetration of agriculture into the forest, which disappears at a pace of 438 ha per year (-4,3%).

Between 1974 and 1985 the forest has disappeared from 19 100 to 12 375 ha, e.g a global reduction of 35 %. Clearing has reached 36% in Grand-Comoro (- 5000 ha), 74% on Anjouan (- 5950 ha) and 53% in Mohéli (- 1800 ha). (AGRAR, 1985). The residual forest is of 33,2% in Grand-Comoro, 16% in Anjouan and 28,6% in Mohéli (FAO, 2000).

This situation has resulted in early water shortages, the disappearance of many species habitats, the shortage of firewood and timber, a disturbance of the hydrologic cycle with the drying-up of rivers and sources, a modification of the rivers regime and an increase of the run-off which favours flooding risks, a diminution of the natural refilling of the underground waters and an acceleration of soils erosion with a reduction of the agricultural production and the hydroelectric potential. The restoration of the basin slopes will enable to regenerate the degraded forests, in view of reconstituting the precipitations regime, restoring and stabilising eroded lands.

Description :

The objective of the project is to increase the water reserves through the restoration of basin slopes in order to allow communities to face early the shortages of the resource generated by climate variability.

The activities will deal with :

- Field survey-consultation, towards different categories of actors;

- National workshops around different uses and professions involved in forests improvement, the economic and social value generated by different products from the forest, communities awareness on the importance of the forest field and ensure their renewal and participation in the management of forests resources;
- Identification of the needs in training;
- Definition of the functioning and running rules;
- Improvement and development of plantations for multiple uses;
- Regenerate degraded forests through species that resist drought;
- Integrated development of the basin slopes;
- Plantation of fodder trees on the lands paths;
- Maintenance;
- Setting-up of windbreaks;
- Planning and exploitation of lands and water resources;

The realisation of the project will require:

- Seeds, compost, chemicals, phytosanitary products, watering cans, plastic bags;
- Technical senior executives;
- Shade nets ;
- Setting-up and maintenance of nursing trees for the production of plants;
- Set of tools;
- Labour
- Transport

In the short term, the aim of the project is to increase the availability of water and firewood and its by-products which cover 74% of the domestic energy needs and develop traditional agroforestry in favour of the production of crops (fruit trees, coffee, vanilla…) associated to forest species. It also aims at reconstituting the hydraulic network in favour of the development of hydroelectric energy.

In the long term, the project will enable to reduce soils erosion, develop agroforestry in favour of agriculture, exploit abandoned lands and diversify the economies of the local administrations, in order to fight poverty and increase food security. It will contribute to the reconstitution of the habitat of many species, to the protection of biodiversity and to the fight against desertification through a participative and reasonable management of forest resources. The project will contribute to the reinforcement of carbon shafts and therefore to the fight against greenhouse.

Implementation:

The project will be carried out by a multisectoral pilot committee for each island, under the supervision of the island Ministry of Environment with the support of the forest services and NGOs operating in the sector, under the national coordination of the Union Ministry in charge of Environment.

The possible risks and obstacles are of several natures:

- The limited human resources of the departments in charge of Forests and Environment;
- The lack of real accountability of the local actors towards the forest resource;
- Multiplicity of occupations and uses of the forests which make difficult indeed conflicting a concerted management
- Limited experience in the process of involving local actors in the management of their village;

- Limits in terms of alternative sources of energy and construction materials accessible to modest households and to micro industry;
- Uncertain potential in terms of the intensification of agriculture without extending the cultivated surface area, in a context of rapid population growth;

The follow-up and evaluation indicators are:

- Increase of the covered surface area;
- Number of regenerated rivers;
- Increase of water availability;
- Flowers occupation rate;
- Reduction of run-off;
- Reduction of the eroded surface areas;

Number of kilometres of the covered anti erosive lines

Cost: 580.000 USD

Project sheet N°4	**Sector of intervention: Water resources** **Project title:** Increase of water supply

Zones of intervention:
Bangoikouni, Pidjani-Mbadjini, Koimbani Oichili et Mbeni (Grand-comoro), Fomboni , Gnoumachioi, Ndrondroni (Mohéli), Chaweni, Mutsamudu, Ouani et Sima, Chandra (Anjouan)

Links with the ongoing and envisaged programmes and with the Multilateral Agreements
National programme on access to drinking water and water improvement, MDG, PRGSP (Poverty Reduction and Growth Strategy Paper)

Recipients
Rural populations from the most dried areas.

Justification:
Climate variability has a negative influence on the quantity of water resources.
Precipitation variations, season gaps and prolonged droughts provoke early water shortages, difficulties in cooking food and the deterioration of the hygiene conditions, particularly in the less watered areas. Moreover, high temperatures increase real evapotranspiration, thus reducing the rate of ground water recharge.

It is therefore imperative for the country to double its efforts in order to improve access to drinking water for the populations that are mostly exposed to the risks of water shortages.

Description:
The ultimate objective of the project is to enable communities, from the most dried areas, to adapt to drought aggravated by the fluctuations of precipitations related to climate modifications.
The project aims, more specifically, at favouring the development of hydraulic in the villages, in order to face water shortages and reduce water-related diseases.

The main activities will deal with:

- Identification of the sources (surface or underground);
- Development of water harnessing, collection and storage infrastructures;
- Extension of the distribution networks;
- Simple pumping wells equipment (manual, solar, wind pumps);
- Public awareness on hygiene and reasonable water management.

The implementation of the project will require the following inputs: water sources that can be exploited, pumping equipment, water mains, construction materials for the storage infrastructures, organisation and management facilities, resources, etc.

In the short term, the aim of the project is to increase the availability and access to water as well as to reduce water-related diseases.

In the long term, the project will contribute to communities capacity-building, in view of a reasonable management and preservation of the resource. The project could also enable to envisage irrigation in view of increasing agricultural production, thus contributing to food security.

Implementation:
The project will be carried out by a multirsectoral pilot committee for each island under the supervision of the Island Minister of Environment, with the national coordination of the Union Minister in charge of Environment.

The limited technical ability of the actors, the level of commitment of the users, the ability to service the infrastructure, the possible delay in the mobilisation of resources, the lack of experience and the weak means of the newly set-up decentralised institutions in charge of supervising the project, could limit the success of the project.

The follow-up and evaluation indicators are:

- Water volume stored and available during the dry season.
- Water access rate
- Cover rate
- Reduction of the prevalence of water-related diseases.
- Degree of mobilisation of the communities around the development of small hydraulic works in the villages
- Increase of the irrigated agricultural surface areas
- Cost of the litre of water.

Cost: **95 000 US $**

Project sheet N°5	**Sector of intervention:** Water resources **Title of the project:** Improvement of water quality

Zones of intervention:
Adda, Salimani, Domoni, Ouani, Mutsamudu, Mirontsi (Anjouan) ; Wanani, Fomboni, Miringoni (Mohéli) ; Wellah Mitsamiouli, Bangoi kouni, Mtsnagadjou, Ouroveni (Grand-Comoro)

Link with the ongoing and envisaged programmes and with the Multilateral Agreements
National Programme on access to drinking water and water improvement, MDG, PRGSP (Poverty Reduction and Growth Strategy Paper)

Recipients
Rural and urban populations.

Justification:
Climate variability has a negative influence on the quality of water resources.
Anjouan and Mohéli are supplied mainly by river waters The quality of the river waters has been altered by the scarcity of the resource, the overexploitation related to the increasing needs of the populations, the effects of erosion, etc.
Bacteriologic analyses made in Anjouan showed that 60% of the harnessing are contaminated at 100% and only 20% are not. This is the main cause of frequent cases of hepatitis and especially typhoid fever which has been prevailing on the island for several years and which is responsible for many deaths. In Grand-Comoro, the quality of the tank water is not good either. According to a survey on Skills, Attitudes and Practices (SAP) conducted in 1999, out of 1813 households, 29% have uncovered water tanks.
Also, the rise in the sea level increases the salinity of the underground water. Out of 44 reconnaissance wells spread out over the coastal zones of Grand-Comoro, only 24 wells have salinity below 3g/l.

It is therefore urgent to double the efforts to improve access to drinking water through the preservation of water quality and its treatment, in order to improve the health of the populations.

Description:
The ultimate objective of the project is to enable communities to have access to drinking water in order to preserve health in a context of precipitation fluctuations and degradation of the quality of the resource, in relation with climate modifications.

The main activities will deal with:

- Setting-up of water treatment infrastructures;
- Training in water treatment;
- Setting-up of protection perimeters around the sources
- Public awareness on water hygiene.

The implementation of the project will require the following inputs: exploitable water sources, equipments and treatment products, organisation and management facilities, resources, etc.

In the short term, the aim of the project is to supply drinking water and reduce water-related diseases.

In the long term, the project will contribute to communities capacity-building, in view of the continuous treatment and preservation of water quality.

Implementation:
The project will be carried out by a multisectoral pilot committee for each island under the supervision of the Island Minister of Environment, with the national coordination of the Union Minister in charge of Environment.

The level of public awareness and commitment of the users, the ability to maintain the infrastructure and ensure the regular supply of treatment products, the possible delay in the mobilisation of financial resources, the lack of experience and the weak means of the newly-set up decentralised institutions in charge of supervising the project, could limit the success of the project.

The follow-up and evaluation indicators are:

- Cover rate in drinking water
- The number of built filtration and decantation basins
- Decrease of the prevalence of water-related diseases.
- Degree of mobilisation of the communities for the preservation of water quality.

Cost: **80 000 US $**

Project sheet N°6	**Sector of intervention: Health** **Title of the project:** Fight against malaria

Zones of intervention:
Grand-Comoro: Hambou, Foumbouni, Mitsamiouli and Mbeni,
Anjouan : Domoni, Ouani, Sima
Mohéli : Nioumachoua, Wanani

Link with the ongoing and envisaged programmes and with the Multilateral Agreements
PRGSP (Poverty Reduction and Growth Strategy Paper)
Strategy axis 4, improving the health status of the population.

Recipients
Populations from the rural and urban areas with a high rate of malaria.

Justification:
Malaria is a major public health issue in the Union of the Comoros. Malaria which was first a stable endemic in the low altitude area has, because of rise in temperature, expanded to the altitude zones which used to be spared.
It seriously affects the health of the population and remains the main reason for consultation and hospitalisation in the health facilities (31% of the consultations and 25% of the deaths recorded within children under five years). People of all ages have been affected by this disease, but children under 5 years and pregnant women are the most two vulnerable groups. Malaria is characterised by a high prevalence all through the year with attacks according to the seasons and the regions. This prevalence is higher in the rural area (32.6%) than in the urban one (25%). The project should enable rural and urban communities to fight the geographic intensification and extension of malaria caused by climate variability.

Description:
The objective of the project is to:

- Fight against the geographic intensification and extension of malaria caused by climate variability,
- Reduce, in a significant way, the possibility of transmission of the vectors of malaria.

The activities will consist in:

- Eliminating the larva shelters inside and around houses, particularly through the improvement of the environment,
- Reducing the proliferation of mosquitoes in the water mains by introducing larva-eating fish,
- Educating and mobilising communities to promote a behaviour that is conducive to the prevention and the fight against malaria,
- Encouraging the distribution and the use of long lasting impregnated mosquitoes nets.

The implementation of the project will require the following inputs: running water, covered tanks, sanitary, means to collect and treat liquid waste, mosquito nets, treatment products, communication media, financial resources, etc.

In the short term, the aim of the project is to create conditions for an improved environment, not conducive to the proliferation of the vectors of malaria, educate and mobilise the population on the methods for the prevention and fight against malaria.

In the long term, the project will contribute to the reduction of morbidity and mortality due to malaria

Implementation:

The project will be carried out by a multisectoral pilot committee for each island under the supervision of the Island Ministry of Environment, with the coordination of the Union Minister in charge of Environment.

The level of awareness and commitment of the communities, the ability to treat liquid waste and ensure regular supply of treatment products, the possible delay in the mobilisation of resources, the lack of experience and the poor means of the newly set-up decentralised institutions in charge of supervising the project could limit its success.

The follow-up and evaluation indicators are:

- Level of prevalence of malaria
- Reduction of the mortality and morbidity due to malaria
- Degree of mobilisation of the communities around the advocated measures
- Level of improvement and hygiene of the cities and villages

Cost: **175 000 US $**

Project sheet N°7	**Sector of intervention: Infrastructures** **Title of the project:** Use of non-metallic local materials for the construction of low price housing**.**

Zones of intervention: Gnoumachioi, Wanani, Siri-Ziroundani (Mohéli); Dadji, Koni, Bandrani (Anjouan); Pimba, Ivoini, Sadani, Dimani/Oichili, Itsandra (Grand-Comoro)

Link with the ongoing or envisaged programmes and with the Multilateral Agreements

- Poverty Reduction and Growth Strategy Paper (PRGSP) (PRSP);
- United Nations Housing Programme;
- Convention on biodiversity;
- Convention on the fight against Desertification;
- Environmental Action Plan

Recipients : The entire population living in precarious houses

Justification:

About 30 to 40%, 50 to 60% and 25 to 30% of the Comorian families respectively in Grand-Comoro, Anjouan and Mohéli live in cob or straw houses with a woody framework, which are vulnerable to bad weather (MICS surveys 2000).

The increase trend of the frequency of cyclones and other extremes of climate events recorded over the past few years has already led to significant material losses and is likely to jeopardise the life of many families.

Indeed, 30% of the constructions are made of concrete and semi-concrete and 70% are made of light structure and are therefore precarious. Access to concrete housing is limited to privileged families, due to the high cost of this method of construction. Whereas straw constructions must be renewed every year, concrete ones made of clay materials better resist the rain and have life duration of several decades.

The outcomes of the census conducted in 1991 forecast, between 1991 and 2010, an evolution of the number of houses estimated at 246.977, in relation with the population growth projections for this period.

The use of new materials produced locally will lead to a significant decrease of the construction costs and facilitate the access of the poor populations from the risky areas, to more resistant and decent housing.
It will therefore enable to improve the security of these populations and housing comfort as well as the hygiene conditions through the local production of sanitary made of these materials.

The proposed project constitutes one of the actions to be implemented in order to contribute to the security of the population, in the face of extremes of climate events, the preservation of enough forest cover, which is necessary for the preservation of soils and river aquifers and biodiversity, as well as climate balance.

Description:

The objective of the project is to:
Reinforce the resistance of traditional housing in order to increase people security, in the face of extremes of climate events and improve the comfort and the hygiene conditions of the households.

The activities will deal with:

- Studies on impact on the environment;
- Crushing of puzzolonic materials (the inventory of which had already been made and tested)

- Manufacture of consolidated clay bricks;
- Research and adjustment of relevant technological procedures;
- Training;
- Support to the creation of private enterprises in the sector of ceramics;

The implementation of the project will require the following inputs:
- Equipment, measuring tools and laboratory equipment (geology, geophysics, geochemistry geo techniques, computer and office materials, calculation software, documentation, vehicles).
- Pool of construction material.
- Crushing equipments, chargers and transportation materials,
- Presses, mixers, shovel tractors and other tools, costs,
- Human resources
- Financial resources

In the short term,

- Creation and operationalisation of centres for the production of the materials ;
- Creation of units for the manufacture of consolidated clay bricks;
- Increase of the construction in concrete and progressive elimination of traditional housing in cob or straw,
- Reduce or avoid losses in human lives during extremes of climate,
- Reduce the cost of the construction of low cost housing,
- Improve housing hygiene conditions and comfort.

In the long term, the project will contribute to:

- Reduce the use of timber for construction and reduce deforestation;
- Reduce sand and coral mining for construction thus reducing coastal erosion;
- Favour the emergence of entrepreneurs in the sector of ceramics;
- Create jobs and ensure training;
- Reduce rural exodus;
- Favour the global equilibrium of the islands.

Implementation:
The project will be carried out by a multisectoral pilot committee in each island, under the supervision of the Island Ministry of Environment, with the support of the national laboratory for Public Works, under the coordination of the Union Ministry of Environment.
The lack of enough architects to propose more attractive construction plans, the substantial decrease of the cost of construction and the possible lack of enough dissemination of technical procedures and the education of the population in the use of baked or consolidated bricks could constitute possible risks and obstacles to the success of the project.

The follow-up and evaluation indicators are the followings:

- Availability of puzzolanic materials for construction;
- Availability of consolidated clay bricks;
- Level of support of the population in the use of local construction materials;
- Number of built houses;
- Diminution of traditional cob or straw housing;
- Spared lives during extremes of climate events;
- Regeneration of beaches and forests

Cost: **1 025 000 USD**

Project sheet N° 8	**Sector of intervention**: Cattle-raising **Title of the project**: Fodder production for goat breeding

Zones of intervention

- Island of Ngazidja: Hambou region;
- Island of Ndzuwani : Kangani and Pomoni;
- Island of Mwali: Itsamia.

Links with the ongoing or envisaged programmes and with the Multilateral Agreements:

- Support programme to the development of cattle-raising in the Comoros (PADEC) ;
- Comoros Local Development Programme;
- Arab Authority for Investment and Agricultural Development (AAIAD) ;
- Poverty Reduction Strategy Paper (PRSP) ;
- Special Food Security Programme (SFSP).

Recipients:

The main recipients are the small goat breeders and the population, to whom goat meat will become cheap and have better quality.

Justification

Early and prolonged droughts accelerate soils degradation and lead to the diminution of the quantity and the deterioration of the quality of fodder as well as to changes in the areas of geographic distribution of a certain number of fodder species, in response to the evolution of climatic conditions. Moreover, in some regions, the unreasonable use of the wood and plant cover (intensive cut of leafy branches, logging for the reinforcement of fences) has accentuated the degrading of pastures and soils.

This situation particularly affects goat breeding which constitutes the main source of income for the peasants and makes more and more difficult the access to meat, particularly for the poorest.

The increase of the quantity and quality of fodder enables to improve the productivity of traditional intensive and extensive breeding in the villages.

This action also allows to protect the woody and herbaceous covers of the existing pastures, regenerate degraded soils and limit the physical degradation of sloppy soils through the defence and a reasonable management of pastures, trees and small fodder trees plantations (leguminous and others) around the goats pen enclosures, and parcel of fodder grasses.

Description :

The objective of the project is to increase the availability of fodder and improve the quality of the pastures as well as the productivity of goat breeding.

The main activities will deal with:

- Constitution of groupings of goats breeders exploiting the same pasture ;
- Training of goat breeders to the techniques of defence and reasonable management of community pastures;
- Plantation of fodder trees around the goats pen enclosures and in the natural pastures;
- Seedbed of improved fodder grains in the natural pastures to be regenerated.

The implementation of the project will require the following inputs:

- Plant materials (tree stumps, fodder grains, plants, cuttings) ;
- Set of tools ;
- Trainers
- Human resources

In the short term, the aim of the project is to increase the quantity of fodder and improve its quality, which are affected by the modifications of climatic conditions. It will also enable to improve the productivity of goats breeding, in order to reduce difficulties by the poor populations to have access to animal proteins.

In the long term, the project aims at limiting the impact of climate variability on goats breeding through the regeneration of degraded soils, the fight against erosion and the disappearance of plant cover. It will enable to increase farmers' income and food security and to reduce children slow development and dependency towards imports.

Implementation:
The project will be carried out by a multisectoral pilot committee in each island in partnership with the groupings of goat producers, under the supervision of the island Ministry of Environment and the technical supervision of the Department of cattle-raising, in collaboration with NGOs specialised in the sector, under the National Coordination of the Union Ministry of Environment.

The possible degradation of climate conditions can limit the regeneration of pastures; the strong demand in goat meat is likely to lead breeders to neglect the reasonable management of the pastures, because of immediate and significant gains. As the joint management of pastures between breeders is a little bit common, it might bring about difficulties as for the reasonable management of the pastures.

The follow-up and evaluation indicators are:
- Number of acres of the regenerated plant and woody cover;
- Quantity and quality of the available fodder;
- Number of goats produced every year;
- Number of trained breeders.

Cost: **100 000 $ US.**

Project sheet n°9	**Sector of intervention**: **Poultry farming** **Title of the project**: Production of provender for poultry farming

Zones of intervention
Island of Ngazidja (for the supply of poultry exploitations in the three islands)

Links with the ongoing or envisaged programmes and with the Multilateral Agreements

- Support Programme to Professional Organisations in the Comoros (PAOPAC) ;
- Support Programme to the Development of Cattle-raising in the Comoros (PADEC) ;
- Comoros Local Development Programme;
- Arab Authority for Investment and the Development of Agriculture (AAIAD) ;
- Poverty Reduction Strategy Paper (PRSP) ;
- Special Food Security Programme (SPFS) ;

Recipients
- The main recipients are the small poultry farmers, the unemployed
- The population.

Justification :

The geographic position of the Comoros predisposes the country to tropical cyclones. The evolution of climatic conditions has led to an increase of their frequency, moving from one cyclone every two years to an annual tendency since 1987. This situation, combined with the distance of the international markets and the high transportation costs, leads to sea links difficulties and is likely to aggravate food shortages, particularly meats, whereas the local production covers only 40% of the needs in animal proteins.

The production of provender favours the development of intensive poultry farming in order to reduce the shortages in animal proteins linked to the irregularity of boats, which are due, in their turn, to the increase of frequent extremes of climate events. It will enable to develop employment through production and marketing.

The creation of a provender production unit, although it will rely on imported raw materials (corn, Soya, mineral, vitamin and protein complements), will enable a competitive cost price compared to the local production of the same raw materials. Indeed, corn competes with the consumption needs of the population. The storage of imported raw materials will enable to reduce shortage risks linked to the disturbance of the sea and air links which are caused by cyclones or other extreme of climate events and will thus favour the continuous production of chicken and eggs.

Description :
The objective of the project is to increase the production of chicken and eggs.

The main activities will deal with:

- Constitution of a national grouping of Comorian Poultry farmers (GNAC) from 3 existing groupings: Association of Comorian Poultry farmers (ASAVIC Ngazidja), Union of Groupings of Anjouanese Poultry farmers (UGAA) and the Association of Producers of Poultry farming of Mwali (ASPAVIM).
- Construction of a provender unit ;
- Purchase and installation of equipments;
- Training of technical staff;
- Launch of the production;

The implementation of the project will require the following inputs:

- Infrastructure,
- Equipments,
- Training ;
- Acquisition of the first stock of raw materials,
- Financial resources.

In the short term, the aim of the project is to ensure the availability of the necessary food for poultry farming (eggs, meat and poultry) and to reduce the risks of shortages related to the disturbances of sea links by the extremes of climate events, which have become more frequent.

In the long term, the project will allow to improve the productivity of intensive poultry farming and the supply of eggs, meat and poultry to the population. It will also enable to develop proximity jobs, fight poverty and reduce children slow development and difficulties for the poorest to have access to animal proteins.

Implementation

The project will be carried out by a multisectoral pilot committee in each island, in partnership with the groupings of poultry producers under the supervision of the island Ministry of Environment, and under the technical supervision of the Department of Cattle-raising, in collaboration with NGOs specialised in the sector, under the national coordination of the Union Ministry of Environment.

The possible degradation of climate conditions can lead to delays in the supply of raw materials and reduce poultry production. The weaknesses of the country in mobilising costs could also constitute an obstacle to the realisation of the project.

The follow-up and evaluation indicators are the following:

- Quantity of produced provender
- Level of local production compared to imports
- Quantity of meat and chicken produced every year
- Number of poor households with access to poultry products

Cost: 90 000 $ US.

Project sheet *n° 10*	**Sector of intervention: Fisheries** **Title of the project: Introduction of Fish Concentration Mechanisms (FCM)**

Zones of intervention: Vanamboini, Ivoini, Itsoundzou, Chindini, Malé, Foumbouni (Grand-Comoro) ; Maraharé, Moya, Ouani (Anjouan) ; Hoani, Ndrondroni, Wallah (Mohéli)

Links with the ongoing or envisaged programmes and with the Multilateral Agreements

- Annual Action Plan on the Fisheries sector
- PRSP and PRGSP
- COMESA fishing programme

Convention of the Tuna Commission of the Indian Ocean

Recipients

Fishermen and fishing cooperatives, the population.

Justification :

Oceanic temperature rises have led to high coral mortality. In 1997, the rise from 1 to 1,5° C of the sea water temperature in relation with the normal temperature (26 to 28° C) has provoked the bleaching and the death of almost 60% of the corals on all the islands, 80% of them on the reef plat and 60% at the level of the external slope. Between 1998 and 2005, the rate of the bleaching observed on 20 stations, which follow up the health status of the reefs is of about 10%. (AIDE, 2005). The situation is translated by a regular diminution of the catches and a progressive increase of the access cost. The lack of motorised boats (1500) in relation with the number of fishermen (8000) does not allow access to deep-sea fishing. The introduction of Fish Concentration Mechanisms (FCM) enables to set the fishing zones in order to increase the catches and therefore the availability of fish, in order to face chronic shortages aggravated by climate variability, particularly heavy rains and cyclones, which limit fishing. It also enables to reinforce the country's initiatives and regional cooperation in the fight against poverty and food insecurity.

Description :

The objective of the project is to increase fish availability in order to allow communities to face the shortages of the resource aggravated by climate variability.

The activities will deal with:

- The locating of FCM anchorage points
- Making and assembly of FCM
- The setting-up and servicing of the FCM;
- Training and education of fishermen on FCM.

The implementation of the project will require the followings:

- Fish Concentration Mechanisms (FCS) ;
- Renting boats for the setting-up of FCS ;
- Ecosounder and GPS.
- Bowls and coding;

In the short term, the aim of the project is to increase and improve the availability of fish, in order to allow communities to face the shortage of the resource aggravated by climate variability.

In the long term, the project will enable to reduce fishing pressure on the coast, and favour the reconstitution of demersal stocks, reduce risk of disappearance of fishermen at sea, in case of extremes of climate events, and reduce slow development which affects 44% of children. The

project will contribute to reduce poverty and increase food security.

The project will be carried out by a multisectoral pilot committee in each island, under the supervision of the Island Ministry of Environment and the technical collaboration of the Directorate for fisheries resources and the national collaboration of the Union Ministry in charge of Environment.

The cyclonic events, the narrowness of the continental shelf, the sea currents and the possible pulling up of FCS by ships could constitute risks for the success of the project.

The follow up and evaluation indicators are:

- Number of FCMs installed and serviced and the productivity of the boats;
- Reconstitution of demersal stocks;
- Reduction of losses of human lives at sea;
- Reduction of children slow development;
- Number of trained fishermen;
- Setting-up of a critical threshold and follow-up of the evolution of ……

Cost : 144. 000 USD
Obtained: 12.000 USD

Amount to prospect : 132.000 USD

Project sheet n°11	**Sector : Fisheries** **Title of the project:** Short conservation of fish under ice to reduce losses after catches, due to high temperature.

Areas of intervention: Vanamboini, Mitsamiouli, Bouni (Grand-Comoro); Nioumachioi, Fomboni, Wanani (Mohéli) ; Domoni, Ouani, Sima (Anjouan)

Links with the ongoing or envisaged programmes and the Multilateral Agreements

- Master plan on fishing
- Annual Action Plan of the fishing sector,
- PRSP and PRGSP
- COMESA Fishing Programme
- Convention of the Tuna Commission of the Indian Ocean

Recipients

- Fishermen and women retailers
- The fishing cooperatives
- The population

Justification:

The increase of temperature (1°C) provokes the deterioration at sea of about 30% of the catches. Moreover, the lack of means of conservation, from the unloading moment to the distribution of fish aggravates the deterioration of the quality of the product and diarrhoea diseases linked to the consumption of rotting fish.

This situation leads to considerable losses of income for the fishermen and reduces the availability of the resource on the market, thus affecting health.

The access to the product becomes more and more difficult particularly for the poorest due to its high cost (4,5 USD/kg), in the face of an incidence of 44,8% of the total poverty of the individuals.
The short conservation of fish under ice will contribute to preserve the quality of the fish, to reduce diseases and to increase tidal times, and therefore the catches. It will allow to reduce the problem related to the Poor's access to the resource and to support the efforts made by the authorities to this end.

Description:

The objective of the project is to ensure the refrigeration procedure, from the place of catches to the place of distribution, in order to reduce or avoid the deterioration of the fish after catches, because of temperature rises.
The activities will deal with:

- The making of ice silos and isotherm trays;
- Assembly;
- Ice production;
- Supply of isothermal trays with ice;
- Training of fishermen and women retailers on the techniques of conservation under ice and the servicing of the machines;
- Dissemination of the conservation techniques.

The implementation of the project will require the following inputs:

- Ice machines;
- Ice Silos and isothermal trays;
- 10 cm wide isotherm panels for the silos;
- Isothermal doors;
- Human resources
- Financial resources.

In the short term, the aim of the project is to reduce losses after catches, increase the availability of fish and ensure a good quality of the product, to improve fishermen income, health and access to the product by the destitute.

In the long term, the project will enable to ensure the availability of fish for a long period of the year and reduce shortages, in case of extreme s of climate events preventing fishing.
The project will contribute to ensure food security, reduce poverty, and secure employment for fish women retailers who, most of the time, are heads of one-parent families and, to consolidate actors' know-how of the techniques for the conservation and hygiene. It will enable to reduce children slow development, the current rate of which is of 44%.

Implementation
The project will be carried out by a multisectoral pilot committee in each island, under the supervision of the Island Ministry of Environment, with the technical collaboration of the Directorate for fisheries resources and the national coordination of the Union Ministry in charge of Environment.

Frequent power cuts constitute factors that can limit the success of the project.

The follow-up and evaluation indicators are:

- Rate of the reduction of the losses after the catches
- Quality of the product sold on the market;
- Increase of the availability of fish on the market ;
- Increase rate of the fishermen income;
- Accessibility of the product by a larger number
- Degree of appropriation of the technique of conservation under ice
- Number of towns and fishermen who benefit from the services.

Cost :336.000 US$**,** 28.000 US$ of which have been obtained

Amount to prospect : 308.000 US

Project sheet N°12	**Sector of intervention: Disaster management** **Title of the project**: Setting-up of an early warning and surveillance system on situations of climatic risks

Zones of intervention: the entire national territory

Links with the ongoing and envisaged programmes and with the Multilateral Agreements

- National Plan on preparedness and response to emergency
- IOC/METEO EDF Project which aims at minimising risks related to tropical cyclones, Convention on the fight against desertification

Recipients

The entire population.

Justification:

The Comoros experiences different types of emergency situations particularly of hydro meteorological type, which are exacerbated by climate modifications. These situations are characterised by cyclones such as the one that occurred in 1950 and which claimed 524 deaths in Grand Comoro and losses of the same magnitude in the other islands. In 1996, Storm Doloresse claimed 67 deaths in Mohéli whereas Cyclone Gafilo was at the origin of the wreckage of SAM-SON, in 2004, which sank with more than a hundred people on board.

Between 1986 and 1999, seven serious cyclones/storms hit the country. Prolonged droughts are also recorded every year with negative impacts on agriculture and health. The setting-up of an information and early warning system is therefore necessary for better preparedness in order to reduce the negative effects of extremes of climate events.

Description:

The objective of the project is to:

Set up a surveillance network of extremes of climate phenomena to ensure preparedness and a relevant response in order to minimise the negative consequences.

The activities will consist in:

- Studying the risks and drawing-up the cartography of the risky zones,
- Circulating in real time the warning reports on the destructive events,
- Educating the population in order to enable it to make the necessary arrangements to face climate risks,

The implementation of the project will require the following inputs: material and equipment for data acquisition, information processing and circulation system, financial resources, etc.

In the short term, the aim of the project is to prevent and prepare the population, through real-time information, on the risky situations in order to reduce human and material losses.

In the long term, the project will contribute to capacity-building in terms of management of climate risks, the creation and the regular updating of a database on the extremes of climate events. It will enable to make a judicious choice, and adapt the cultural calendar in relation with weather forecast.

Implementation:

The project will be jointly carried out by the National Directorate of Meteorology and the Directorate for civil security, under the coordination of the Union Ministry in charge of Environment.

The level of awareness of the population on climate risks and on support to the provisions to be set up, the limited means of the public services to ensure the regular functioning of the warning system,

the limits in the ability to mobilise financial resources could constitute risks and obstacles that may limit the success of the project.

The follow-up and evaluation indicators are:

- Diminution of human and material losses caused by climate disasters
- Quantity of obtained data
- Communication, information and education medium
- Operationalisation of the coordination and disaster management structures
- Degree of mobilisation of the communities around disaster management

Cost: **75 000 US $**

Project sheet n°13	**Sector of intervention :** Health **Title of the project :** Support to eye, medical and surgical care

Zones of intervention: the entire national territory.

Links with the ongoing and envisaged programmes and with the Multilateral Agreements
National Health Programme, Poverty Reduction and Growth Strategy Paper, Programme of the Organisation for the Prevention of Blindness (POPB).

Recipients
Populations affected by blinding cataract.

Justification :
Over the past years, climate variability has brought about changes in the pathologies in the Comoros. They remain dominated by communicable diseases, malaria, diarrhoeal diseases etc …
There should be noted, however, the emergence of eye affections such as blinding cataract, favoured by the increase of the incidence of ultraviolet rays, following the destruction of the ozone layer.

According to some estimates, the prevalence of blindness in the Comoros rises by between 0, 6 and 0, 8%.

The number of people to be operated on for this disease would rise by between 3240 to 4320; the number of the partially sighted is estimated between 9720 and 1300 peoples. 2300 to 3050 individuals are currently waiting to be operated on, and 540 peoples become blind every year because of cataract, for a population of about 588 000 inhabitants.

Considering the geographic division of the islands, the majority of the population is not well provided at the ophthalmologic plan.

The setting–up of a mobile ophthalmic surgery unit to be placed at the disposal of this population in the islands proves to be necessary and indispensable in order to fight against blinding cataract.

Description :

The objective of the project is to reduce the rate of blinding cataract through surgical care, in favour of the populations which are not well served on the ophthalmologic plan, and increase care in favour of those who are affected by this disease.

The activities will consist in :

- Setting-up a medical team;
- Ensuring basic training for the different categories of staff, in detecting cases requiring surgery and post surgery check-ups;
- **Creating a mobile ophthalmic surgery unit;**
- Detecting the cases requiring surgery;
- Informing and educating the population on the pathology

The realisation of the project will require the followings :

- Portable operating microscope;
- Autoclaves or sterilisers ;
- Cataract surgical kit ;
- Eyelid surgical kit;
- Intra-ocular lens implants;

- Mountain rolling stocks;
- Financial and human resources.

Implementation :
The project will be carried out by a specialised national NGO, the Organisation for the Prevention of Blindness in collaboration with the health districts.

In the short term, the aim of the project is to enable people affected by cataract to recover their sight, to increase the ability to intervene and improve patients' care.

In the long term the aim of the project is to favour the promotion of eye care through the integration of its activities in the different medical centres, at the service of the population, which are not well provided with ophthalmologic cares.

The lack of enough trained personnel and the limited abilities in cataract surgical care are the predictable risks and obstacles that can undermine the project.

The follow-up and evaluation indicators are:

- Number of consultations per month and per centre;
- Number of peoples operated on cataract per month and per eye surgery centre;
- Number and percentage of intra ocular lens implants prescribed or distributed
- Reduction of the curable blindness for the operated patients.

Cost : **122 000 USD**

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