MOZAMBIQUE: NAPA PROJECT PROFILE

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MOZAMBIQUE

NAPA PRIORITY PROJECT 1

FIRST ACTION: STRENGTHENING OF EARLY WARNING SYSTEM

INTRODUCTION

A proactive attitude in relation to natural disasters depends necessarily on deep knowledge on the type and quality of environmental conditions in which one lives. The success of early warning system plans with the view to reduce the effects resulting from environment phenomena, as important part of management of such natural disasters, depend on knowledge that the intervenient have on the same phenomena, of their impacts, of the contention and adaptation measures and also of an effective communication. Thus, public education on the prevention and adaptation methods is crucial in the management of disasters under the framework of adaptation to climate change.

RATIONALE OF THE PROPOSED ACTION

The need for communities to have timely early warning information and the awareness of actions to be taken based on information received may reduce the loss both of human lives and the properties that normally takes place when extreme events occurs.
Considering the extensive network of pluviometric stations that the Ministry of Agriculture has mirrored in all corners of the country, there's a need to standardize these stations with those used by the weather services and equip them so that they can collect information on meteorological elements, in a format that can contribute to improve the precision of weather and climate variability.
The collected data will help to make weather forecast more precise and seasonal and will also help for future climate studies in the different sectors. In addition, it will help to improve the transmission of information on time.

DESCRIPTION

Objectives

To strengthen the early warning system so that the information can reach the affected communities in good time in a way and format those communities can use it. This information specifically aims to:

- Evaluate the current state and functionality of the early warning system;
- Identify the local knowledge of forecasting climatic events and evaluate its adaptability in the early warning system;
- Evaluate the degree of the vulnerability risk;
- Monitor the functionality of the early warning system so as to identify in opportune moment to the deficiencies of the system.

Expected Results

Due to the level of difficulties that each activity presents, the expected results can be sub-divided into long term comprising 2 (two) to 5 (five) years and short term understood to be a period inferior or equal to 2 (two) years.

Long term results I

Weather forecast system and improved seasonal forecast and consequent reduction of losses of human lives and properties.

Short term Results I

More precision in the weather and seasonal forecast resulting from standardization of existing pluviometric stations in the country under the auspices of various organizations (ex: Ministry of Agriculture, world vision, Plexus, etc.) with the stations of the national meteorological network under the auspices of the National Institute of Meteorology and increase the density of the national meteorology stations.

Activities to carry out

1. Information survey on the current existing pulviometric stations at national level and its evaluation in order to integrate these into the INAM meteorological stations to standardize the collection of meteorological data;
2. Survey of the present state of stations of the national meteorological and hydrological network of stations and evaluate the need to install new stations in other local areas
3. Install new meteorological and hydrological stations in identified local priority locations.
4. Standardize the collection of data from the pluviometric stations under the auspices of the Ministry of Agriculture, Fisheries, ARA's, INAM, world vision, Plexus, and other organizations operating in the area;
5. Train technicians in charge of collecting data from the standardized stations;
6. Enable the meteorological services to update seasonal forecast every month.
7. Improve the quality of network and operation of hydro-metric and hydro-meteorological stations, through the use of modern equipment.
8. Reinforce the storage and processing of data and the dissemination of hydrological information.
9. Create a permanent technical committee to monitor the evolution of exchange mechanisms of information between different segments of management of water resources.
10. Strengthen institutional capacity in the collection, analysis, validation and monitoring of hydrological data, through the holding of training courses.
11. Consolidate (or dynamize) the continuous maintenance of used equipment in the hydrometric stations to guarantee and quality of collected data.

Long term results II

Early warning information timely received from the affected administrative posts or at risk.

Short term results II

Risky and vulnerable areas identified, classified under the risky and vulnerable point of view and mapped up to the level of Administrative Post.

Activities to develop

1. Select, on the basis of the existing information on vulnerability, the districts to be considered in the pilot phase;
2. work out the social, economic and physical profile of the Administrative Posts which are vulnerable to drought, floods and tropical cyclones;
3. Map out and classify Administrative Posts according to the degree of vulnerability;
4. Requalify crowded populations from flood and cyclone prone areas;
5. Identify the places of refuge and evacuation channels in the Administrative Posts which are prone to hydro-meteorological events.

Short Term Results III

System to disseminate locally-established early warning mechanisms.

Activities to develop

1. Identify and evaluate the local systems for the management of extreme events (examples: the appearance in a certain place of some birds in a determined season of the year, the change of colours in leaves of some trees);
2. Identify, together with the communities and administrative bodies, necessary actions to improve the local systems for the management of extreme events, including the installation of a system to receive and disseminate early warning information in due time;
3. Support the improvement of communications means and access roads in the country and particularly in risky and vulnerable areas;
4. Strengthen the capacity and the involvement of media organizations in the dissemination of warning information and of encouragement to communities on matters of climate change;
5. Use of local (informal) communications channels, for example, religious authority, community, school authority, etc.
6. Improve the information exchange mechanisms with neighbouring countries under the framework of weather and seasonal forecast;
7. Promote the creation and training of local committees to manage climate disasters.
8. Promote the exchange of experiences among local communities on local skills to manage extreme events, including actions carried out to minimize their effects;
9. Divulge and encourage local communities on matters linked to climate change, causes and effects.
10. Monitor the forecast evolution taking into account possible changes they may occur during the rainy season;
11. Create a monitoring committee for the purpose.

Long Term Results III

Improve inter-sector coordination in the use and dissemination of warnings and in the assistance to communities.

Short Term Results IV

Reduce the duplication of efforts and resources in activities to support communities vulnerable to extreme climate events.

Activities to develop

1. Train technicians of relevant sectors (such as fisheries, water, agriculture, health, environment and management of natural disasters) in the use of early warning and seasonal forecast and dissemination ways in communities;
2. Strengthen the capacity and involvement of the Mozambique Armed Forces in rescue operations;
3. Identify, map out and evaluate the activities and/or mandates of different groups and/or integrated communities in the management of risk, natural disasters and climate change;
4. Establish synergies between the different committees/groups that deal with issues related to climate change and/or natural disasters;
5. Create the data base on studies made and or implemented projects in the country on climate change and/or management of risk of natural disasters as well as of experts on these fields;
6. Train local bodies in data systematization on natural disasters;
7. Produce matters and radio and television programmes and other education means (theatre, debates/workshop) and of encouragement on issues linked to climate change;
8. Hold regional seminars for publication and encouragement.

Risks and Barriers

Peace and political stability are essentials for success in the implementation of any project. The identified risks and barriers that can block success are:

- Communications problems allied to bad conditions of access roads are factors that can constitute barriers in the holding of proposed activities in this action;
- Weak precision of weather and seasonal forecast, derived from various factors of which the following can be stressed: weak sensibility of people in charge of collecting data, weak density of meteorological stations, weak technical capacity and the obsolescence of used equipment in the collection of data.
- The weak level of education.
- Strong departmentalization of sectors.

IMPLEMENTATION

The implementation of activities listed in this action will be of the responsibility of specialized entities, INAM, INGC, Technical Committee for the Management of Natural Disasters, (CTGC) MINAG, MTC, MEC, ONG's, MOPH (DNA, ARA's ANE), MPescas, MAE, INTC, Media, Rsearch Institutions, Private Sector and the Civil Society in general.

BUDGET

Estimated at USD 2,700,000

Activities	Estimated cost in USD
Mapping and requalification of administrative posts and crowded people	1 280 000
Rehabilitation or installation of Synoptical/Pluviometric and hydrological stations	300 000
Training and capacity building	150 000
Education and sensitization	100 000
Seminars (10 Prov., 1 National)	105 000
Improvement of Communications system	100 000
Creation of systematized data bank at district level on the occurrence and impact of natural disasters	165 000
Creation of disaster management local committees	500 000
Total	2 700 000

In an initial phase, the installation and/or rehabilitation of about 15 synoptical stations are envisaged following a territorial distribution almost in a uniformed mesh. Mapping will be carried out in all administrative posts covered during the participative validation process (see map of picture 3 in NAPA).

MOZAMBIQUE

NAPA PRIORITY PROJECT 2

SECOND ACTION: STRENGTHENING OF CAPACITIES OF AGRICULTURAL PRODUCERS TO DEAL WITH CLIMATE CHANGE

INTRODUCTION

Agriculture continues to be the most important sector for the economy of Mozambique. According to estimates based on the 1997 population census and on the 2001-2005 plan of action to reduce absolute poverty, Mozambique has a little over 17.5 million inhabitants and, according to the same source, about 80% of the economically active population is linked to agricultural production and 70% of them live under extreme poverty conditions.

The results of TIA 2002 show that the agricultural and livestock sector is dominated by small scale agricultural exploration constituting 99.7% of the country's explorations and occupied 96.7% of the cultivated area in 2000/2001. They practice agriculture of subsistence, with low agronomic income. The use of raw-material such as manure and pesticides, the irrigation practice and the use of mechanized equipment in agricultural production are extremely insignificant.

The five year (2005-2009) government programme defines as the objective of the agricultural sector to contribute for self-sufficiency and food security in basic foodstuffs, to increase agricultural productivity, guarantee the supply of raw-material to the national industry, promote and support the development of the family, cooperative and private sector and job creation. Thus, the government intends to stimulate the increase of production in the area of commercial agriculture development and promote agro-industrial development which adds value to the country's agricultural products for the national market and for export, mostly in the rural areas.

One of the main challenges faced by PROAGRI is to provide necessary and sufficient support to a heterogenic group of farmers that continues fighting to produce enough for subsistence, at the same time the march is towards a situation of a more market oriented agriculture.

In addition to previously described aspects, agricultural production is mainly limited by the drought resulting from climate change. The country has experienced deficit of food security in some areas due to drought that has been taking place over the years.

Changes of the standards of precipitation, air temperature, atmospheric humidity and radiation – essential elements for the production of organic matter and for basic activities of plants such as photosynthesis, growth and development have been affecting the country's agricultural productivity. Thus, actions must be taken to revert this situation which competes to aggravate more and more the poverty situation of the rural Mozambican people.

RATIONALE OF THE PROPOSED ACTION

The importance of agriculture in the country can be summarised in two main aspects: The first as a source of food and the second as the basis for development. Despite its importance, agriculture is practised in unirrigated land and with few investments given to the weak financial capacity of the rural communities.

Support in agricultural instruments and raw-material, construction and/or rehabilitation of irrigation systems will reduce the loss both of animals and of crops during the dry season resulting from

climate variability currents and consequently it will increase the capacity of beneficiaries who deal with climate change.

DESCRIPTION

Objective

Develop capacities of agricultural producers to deal with variability and climate change.

Expected Results

Long Term Results I

Loss of crops and animal population reduced in regions prone to drought, floods, cyclones and tropical storms and other climatic events.

Short Term Results I

More availability of agricultural and livestock foodstuffs

Activities to develop

1. Promote associativism among farmers, cattle and goat breeders of the family sector and fishermen for better assistance;
2. Build systems for the collection and conservation of rain waters for subsequent use in the drought season;
3. Drill wells or water boreholes;
4. Install small scale sustainable irrigation systems, exploring the use of renewable energy to feed the system;
5. Build and/or rehabilitate tanks and dynamize vaccinations;
6. Encourage applied research of crops tolerant to drought and plague, and the use of short cycle crops;
7. Promote the value of sacred forests for eco-tourism purposes;
8. Disseminate and encourage the use of crops tolerant to drought;
9. Promote the certification of seeds sold in agricultural fairs;
10. Encourage the local production of seeds;
11. Promote the holding of agricultural fairs mainly in vulnerable areas, increasing their coverage;
12. Promote the use of hays and animal food to feed the cattle;
13. Evaluate quarterly the implemented activities together with communities in the first 12 months by the NAPA Team members.

Long Term Results II

Reduce the degradation of soils due to inappropriate agricultural practices.

Short Term Results II

Reduced degraded areas

Activities to develop

1. Identify, classify, map the solid degraded areas due to inappropriate agricultural practices;
2. Promote the use of renewable energies, mainly biogas close to cattle breeding communities;
3. Encourage the use of conservation agriculture;
4. Monitor the national situation of erosion after the rainy season;
5. Promote community reforest activities aimed at producing bio-mass for energy consumption and along the sensible areas in river basins for their protection;

6. Promote community reforest activities using native species for their conservation;
7. Promote community activities to manage fires;
8. Promote community activities for the fight against erosion in all places.

Long Term Results III

Established alternative subsistence forms

Short Term Results III

Rise in family income

Activities to develop

1. Promote simple technologies on procession and conservation of food and seeds;
2. Encourage the cultivation of cash crops;
3. Promote finance of small scale businesses;
4. Promote the sustainable use of natural resources;
5. Promote the planting of species used in the production of bio-fuels in arid and semi-arid areas.
6. Encourage the practice of extra-agricultural activities (pisciculture, apiculture, art craft, etc.)

Risks and barriers

The following constitute risks and barriers:

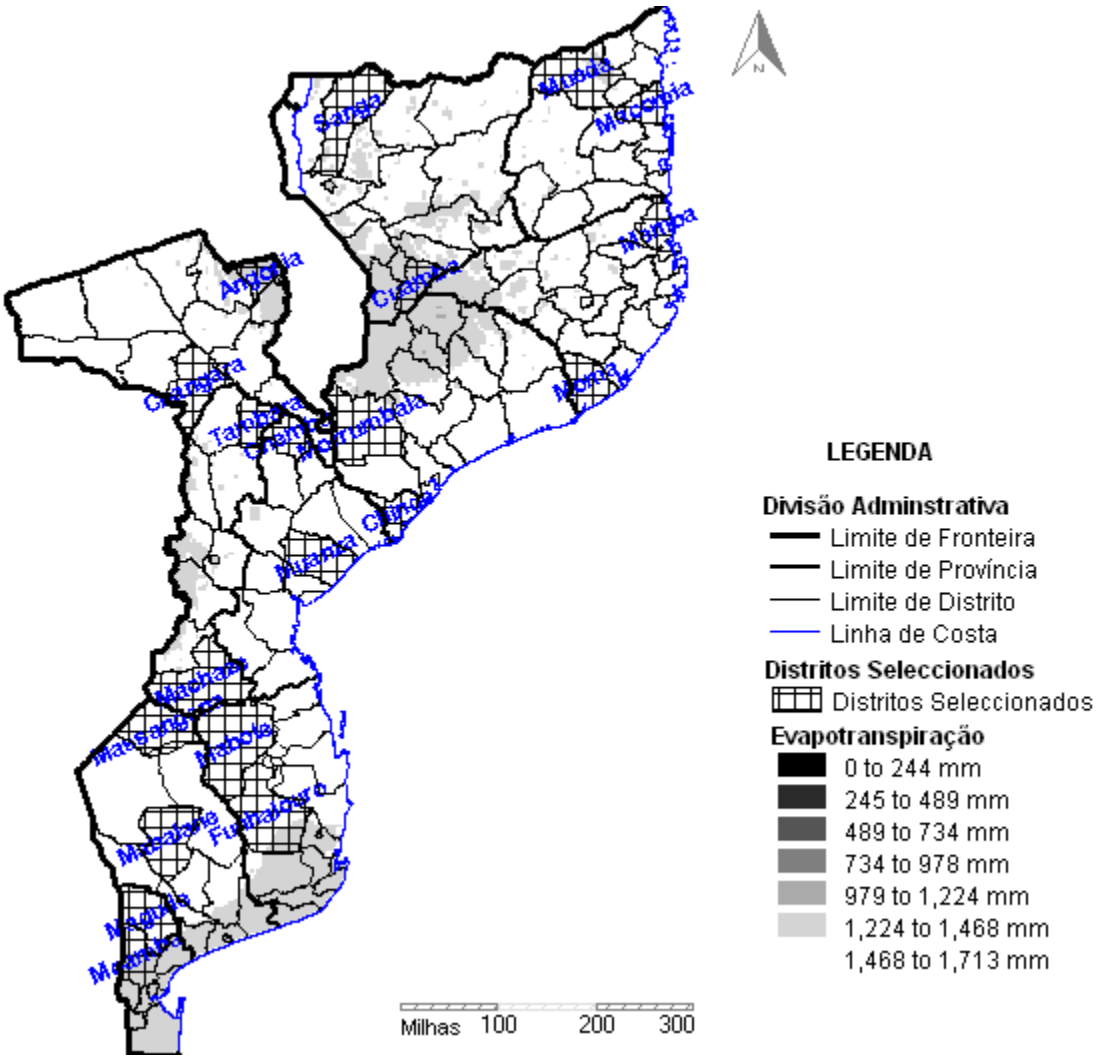
- The weak involvement of local communities;
- The weak coordination among the people involved;
- Delays in allocating funds;
- The weak network of extension services capable of providing technical assistance and the transfer of necessary and adequate technology to the production system;
- The lack of access infrastructure and rural market for the purchase and sale of agricultural tools and products in due time;
- In addition, the agricultural research network needs to be more responsive to the multiple problems of the agricultural sector.

IMPLEMENTATION

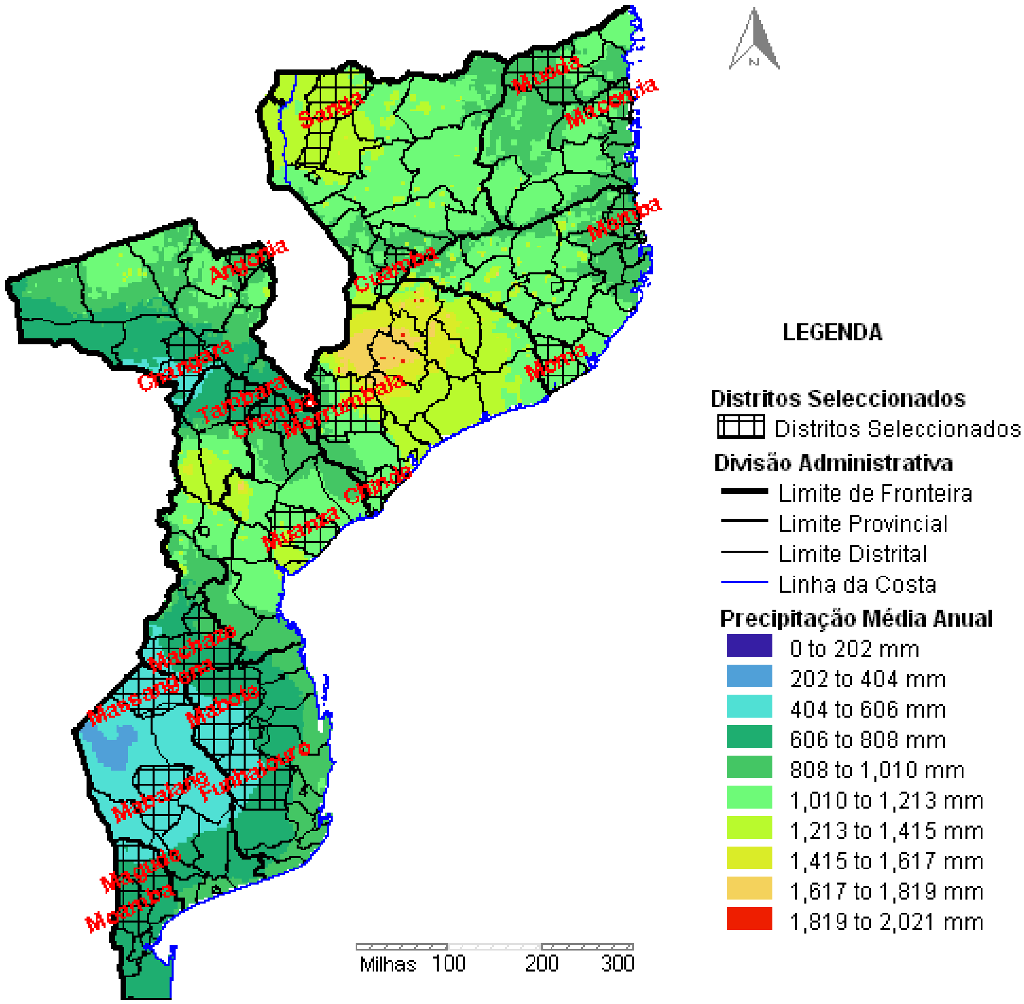
The implementation of activities of this action will be of the responsibility of the following institutions: MINAG, ME, MOPH, DNA, MIC, MF, MIREM, MIDefence, ARA's, INAM, MITUR, MAE, DINAGECA and with the collaboration of the Private Sector and the Civil Society.

In the first phase, it's suggested that these activities be developed in the districts of Magude and Moamba (Maputo), Mabalane and Massangene (Gaza), Funhalouro and Mabote (Inhambane), Chemba and Muanza (Sofala), Machaze and Tambara (Manica), Angónia and Changara (Tete), Mueda and Macomia (Cabo Delgado), Chinde and Morrumbala (Zambezia), Moma and Memba (Nampula) and Sanga and Cuamba (Niassa). The choice of these districts had as criteria: degree of vulnerability to drought (for the most drought-prone provinces), degree of vulnerability to floods (for the most flood prone provinces), the poverty index, availability of extension activities. Thus, it does not mean that all activities will be developed in all selected districts. Depending on the characteristics of each, only activities that will bear more impact in the community will be selected and developed.

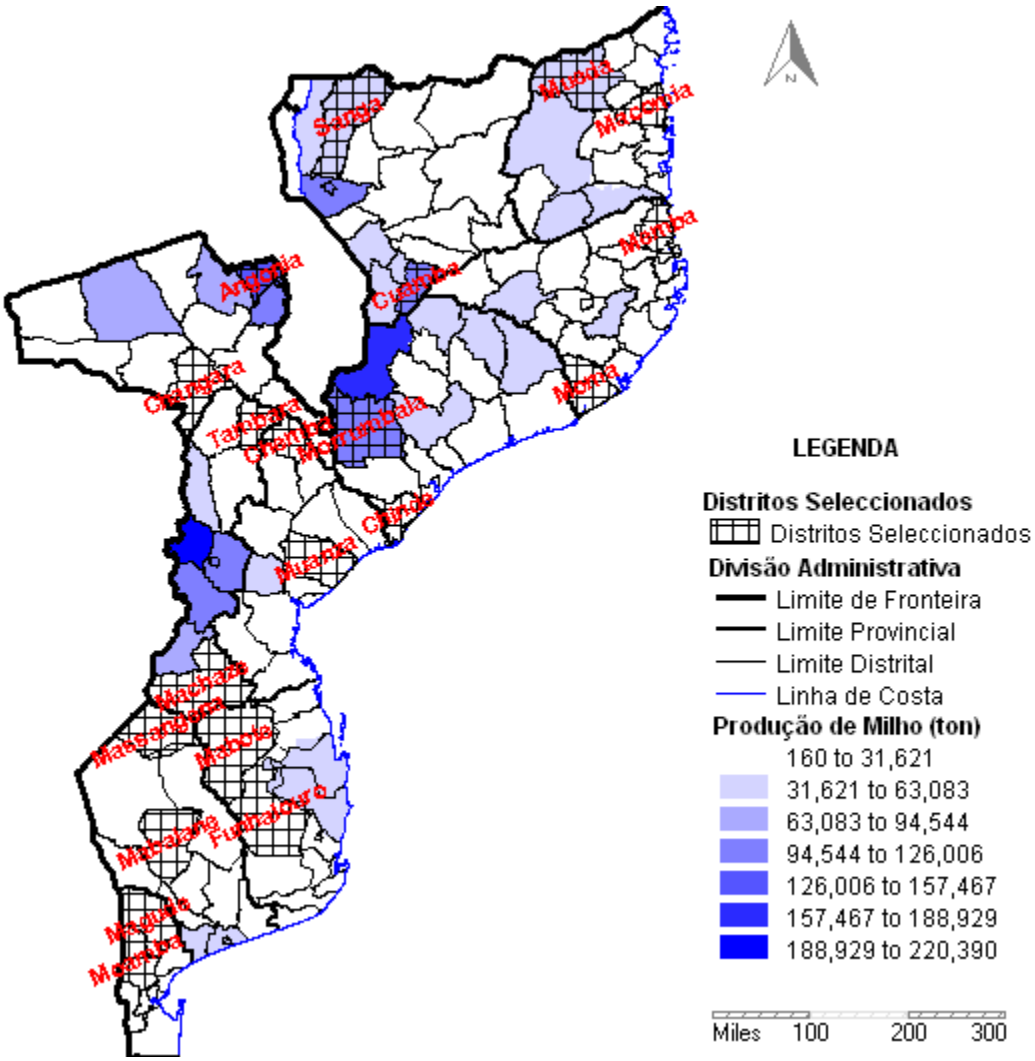
Pictures 7, 8, 9 and 10 show the distribution of the evapotranspiration, precipitation, total production of maize and in the 1999/2000, 2000/2001 and 2003/2004 campaigns per district and also illustrate the selected districts for the implementation of proposed projects in a first phase.



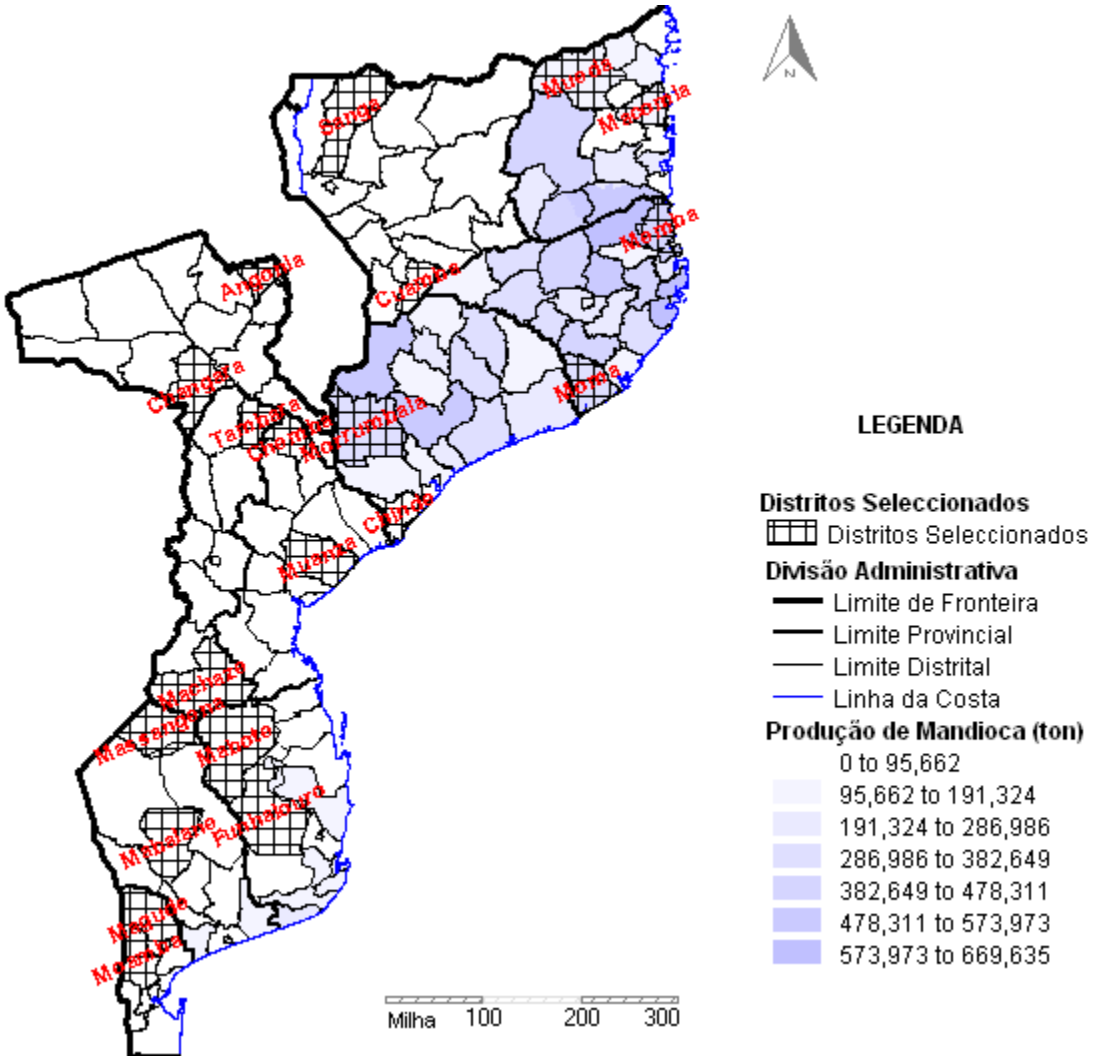
Picture 1: ***Map of evapotranspiration in the country, indicating the selected districts.***


Sanga
Mueda
Angonia
Cuamba
Changara
Tambara
Chemba
Morrumbala
Chinde
Muanza
Machaze
Massangena
Mabote
Mabalane
Funhalouro
Magude
Moamba
Milhas 100 200 300
N
LEGENDA
Distritos Seleccionados
Distritos Seleccionados
Divisão Administrativa
Limite de Fronteira
Limite Provincial
Limite Distrital
Linha da Costa
Precipitação Média Anual
0 to 202 mm
202 to 404 mm
404 to 606 mm
606 to 808 mm
808 to 1,010 mm
1,010 to 1,213 mm
1,213 to 1,415 mm
1,415 to 1,617 mm
1,617 to 1,819 mm
1,819 to 2,021 mm

Picture 2: ***Distribution map of precipitation in the country and the selected districts.***



Picture 3: ***Distribution of total production of maize in the 1999/2000, 2000/2001 e 2003/2004 campaigns per district and of selected districts.***



Picture 4: ***Distribution of total cassava production in the 1999/2000, 2000/2001 per district and of the selected districts.***

BUDGET

Estimated at USD 2,500,000

Activities	Estimated cost in USD
Reduce soil degradation due to inappropriate agricultural practices	1 000 000
Reduce loss of crops and animal population in regions prone to drought, floods and tropical cyclones	1 000 000
Establishment of alternative subsistence forms	500 000
Total	2 500 000

MOZAMBIQUE

NAPA PRIORITY PROJECT 3

THIRD ACTIVITY: REDUCTION OF THE IMPACT OF CLIMATE CHANGE IN COASTAL ZONES

INTRODUCTION

Mozambique has the third longest maritime coast in the African continent extending for about 2,700 square kilometres in straight line, characterized by a vast variety of eco-systems such as estuaries, dunes, mangrove forestry, coastal lakes, banks and coral reefs, marine weed and swamps. These eco-systems represent critical habitats for various species of ecological and economic value, among others.
The social and economic activities being developed along the coast such as fisheries, port exploitation, tourism and sports as well as the mining of heavy sands, gas and other potential hydrocarbons still under prospect ion represent a significant value to sustain over 60% of the people residing in the first 50 kilometres of the country's continental coastal zone.

On the other hand, the land based activities such as the establishment of industries to transform raw-material in the coastal cities, including the industrial development of those adjoining regional rivers, the repressing of water and consequently the sediment, contribute significantly for the reduction of the quality and quantity of available water for the maintenance of regular processes, transport and deposition of sediments which influence the erosion tax of various areas, as well as the productivity of areas to grow marine invertebrates, influencing negatively the availability of fisheries resources and to ecological tourism. These problems are yet exacerbated by the lack or inefficient treatment of the industrial and domestic residues, often discharged into rivers and seas, without any previous treatment.

Many marine and coastal ecosystems do not bear the level of human interference in particular have a low resilience and can result in a progressive and irreversible degradation of the coast, because in addition to above mentioned factors, a substantial part of the fisheries resources are heavily or over exploited by men.

The coastal line is doubtlessly one of the most dynamic features of the planet. Its position in the space changes constantly in various time scales (daily, seasonal, decadal, secular and millenary). The position of the Mozambican coast line is affected by a considerable number of factors, some of natural origin and intrinsically related with the coastal dynamic (like the action of waves, dispersion of sediments, winds, tides, currents and tropical cyclones) others related to human intervention in the coastal zone with practices of agriculture, deranged constructions of buildings along the seafront, port activities, repressing of rivers, mining of sand and other activities.

The action of extreme climate events such as tropical cyclones and heavy rains occurring frequently along our country's coast are natural phenomena responsible for significant changes of the coast line as a result of a strong erosive action that they are characterised by.

As a result of the interaction between these various factors, the coast line has been suffering from the erosion phenomenon. This phenomenon resulting from the dynamic of Mozambique coastal systems is due to natural causes in more than 90% of the coast line extension, because the area of the seafront occupied by coastal cities constitutes about 10% . However, the areas occupied by the cities and concomitant adjoining suburban areas are those which show more critical situations of erosion both in the coastal zone and in the country's interior.

In the coastal region of southern Mozambique, the average setback rate of the coast line is in the 0.11 and 1.10 metres per year between 1971-1975 and 1999-2004, in sheltered beaches and exposed to undulation of oceans respectively. However, in certain areas the anthropogenic causes of these processes have been the dominant ones and include, among others, urban and port expansion and more recently the deranged expansion of tourism. For example, the Ponta d'Ouro beach shows a reverse of 0.95 to 1.75 metres/year.

Most of Mozambique's cities and towns are vulnerable to environmental incidents due to its population growth combined with inefficient planning of its land use and settlement which have led to erosion brought about winds of heavy rains, forming very deep ravines in certain cases and causing the collapse of earth in other cases. On the other hand, various cases of floods partially reaching cities and towns have been reported mainly in the southern region.

The centre of vulnerability to erosion in the country's coastal zone spreads particularly on latitude 20º. This region is characterized by a delta and mangrove zone in the north and high vegetated dunes in the south. Its interior is characterized by plain area often prone to floods in case of extreme climate events. These are extremely fragile systems in which the deranged action of men speeds up erosion substantially. In the particular case of coastal dunes, this suffers a big pressure resulting from the development of tourism and urban expansion. In the area between Save and Zambezi rivers, erosion has been aggravated in the past years by the growing cut of mangroves and the reduction in the volume of sediments from the Zambezi river after the construction of the Cahora Bassa Hydro-electric Dam.

There's no intense erosion in the northern region of Mozambique because it has a protected coast by coral reefs which form an almost continuous fringe. However, these are under a strong threat of an intense extractive activity, over-fishing and the global phenomenon of increasing the medium level of sea waters.

RATIONALE OF THE PROJECT

Mozambique is a country where about 60% of the population lives in the coastal zone, and on it the population develops the main economic and subsistence activities, with the growth of the leisure, mining, petroleum and gas industry and aquaculture projects which turn it extremely vulnerable to any disturbances. The cut of vegetation and mangrove, the destruction of dunes, the destabilization of the coastal sand and islands, contribute significantly for the advancement of erosion. This fact is noticed chiefly in the big urban centres and surrounding area which are mostly coastal, with a rapid growth of its population and a defective planning of land use whose response – both technical and scientific and strategic have been sporadic and often with inadequate finance resulting from inadequate interventions. Therefore, the control of the use of land in the coastal zone and the development of strategies for the protection against erosion are becoming urgent. The country is still defective in policies to control and regulate coastal erosion caused by anthropogenic factors. In addition, few studies related with adaptations to the impacts of climate change have been carried out. Therefore, the task of integrating adaptation strategies to climate change and the reduction of the impact of disasters must go through the restructuring of the current practices of land use, elaboration of programmes to develop scientific knowledge of phenomena associated with erosion, the policies and strategies that must be incorporated in sector plans for the implementation, well so, of the regulation and inspection of social and economic development.

Strategic integration

The (2005-2009) PARPA says that the improvement of the environmental condition depends on adequate planning measures, or urban prequalification measures, namely the

elaboration of the land registry and soil ordaining, correct adoption of access infrastructures, drainage and water supply; it also considers that the big environmental priorities in Mozambique focus on the following areas: (a) sanitation; (ii) territorial ordination; (iii) prevention of soil degradation; It's also considered that issues related to environmental governance as well as the recognition of the relation between environment and poverty must be paid attention, with focus on environment education, tourism, mining, fisheries, management of coastal and marine areas, technology, vulnerability and natural disasters, among others.

The government 2005-2009 five year programme considers research and testing of appropriate practices and technologies for the fight against erosion, drought and conservation of bio-diversity, among others, as one of the strategic objectives.

General objectives

Contribute for the sustainable development of the coastal area through the reduction of social and economic impacts derived from climate changes introducing coastal integrated management systems based on the community and elevating the consciousness of state and community institutions on the vulnerability of the coastal zone.

The following are specific objectives:

1. to identify, characterize and map out the eroded land units and the coastal vegetation;
2. to identify rehabilitation techniques of dunes and mangroves to mitigate the effects of erosion;
3. to identify participative actions to illustrate the mitigation of erosion;
4. to evaluate the legal and institutional framework to control and mitigate erosion;
5. To develop strategic actions to sensitize and disseminate the results and good practices in the coastal communities.

Expected Results

1. Systematized and mapped knowledge on eroded areas and those prone to coastal erosion, identified causes and evaluated social and economic impact of the problem;
2. Elaborated technical and scientific measures for the fight and/or mitigation and the respective chronogram of activities as well as the preliminary evaluation of the intervention costs;
3. Identified adequate techniques of small, medium and long term intervention, including participative mechanisms to solve and or mitigate problems erosion;
4. Transmitted practical knowledge and techniques for the fight/mitigation of erosion to affected communities shown;
5. Identified main gaps of the legal and institutional framework on erosion and proposed scenarios of institutional arrangement appropriate to the current reality and, recommended amendments and contribution to on-going legislation;
6. Identified and tested the effective methodology for the transmission of knowledge on erosion and ways to prevent, mitigate and fight and the community adoptable processes.

Long term results I

Adaptation measures to climate change adopted in the local strategic and development plans, minimizing or eliminating the effects of coastal erosion in the region's social and economic development and with positive social impacts on agriculture, water availability, sanitation, human settlement, protection of the coast line as well as in the bio-diversity.

Adequate adaptation technologies to climate change and the reduction of risks of disasters under application and documented to allow its extension;

Short term results I

Eroded areas and coastal vegetation identified and dunes and mangroves reforested.

Activities to develop

1. Prepare maps of eroded areas;
2. Evaluate the state of erosion and identify the causes and consequences;
3. Prepare recommendations on mitigation intervention to be introduced;
4. Prepare maps on coastal vegetation;
5. Inventory and describe the type of vegetation, species, its distribution and abundance as well as its exploitation status;
6. Estimate the deforested areas, identify the causes and consequences;
7. Prepare recommendations on mitigation interventions to be introduced;
8. Planting of (native) trees in the mangrove zones which were deforested;
9. Evaluate the level of damages and the establishment of goals to rehabilitate dunes and degraded mangroves;
10. Establish a morfo-dynamic monitoring system of dunes, beaches and mangroves through the collection of different types of data such as topographic, oceanographic and chemical and biological indicators;
11. Characterize the function of water changes and erosion phenomena in the regions of the estuaries, caused mainly by the blockage of rivers;
12. Describe the changes of the coast line, of the vegetation and of the land use through the material interpretation of the remote sensory in the cities of Maputo, Beira and Nacala.
13. Propose and list environmental social and economic models for the treatment of impacts caused by the change of the coast line.

Long term results II

Development and establishment of social and economic infrastructures based on ecological zoning and, local sector plans and projects aimed at tackling short, medium and long term demonstrative actions to combat and/or mitigate erosion for an effective adaptation to climate change with the involvement of the local communities and the private sector in particular, in implementing the various critical points.

Short Term Results II

Directives on the methodologies for the fight against erosion and its mitigation through tested and documented participative actions.

Activities to develop

1. Zone areas according to its present use, potential and ecological value (and defined conservation/reforest value, cutting of firewood and charcoal, agriculture, livestock, etc.)
2. Establish general norms to be observed in micro-zones
3. Identify and implement participative alternatives to exploit coastal natural resources;
4. Construction of protection barriers in densely populated areas with erosion problems;

Long term results III

Adequate legal and institutional framework for climate change adopted to tackle issues on coastal erosion and under implementation.

Short term results III

A new legal and institutional arrangement model has been developed to regulate coastal erosion.

Activities to develop

1. Evaluate the legal and institutional framework on erosion and the elaboration of specific recommendations on it including specific recommendations for areas regarded as critical;
2. Develop an national policy that involves actions to restrict development or prohibits the re-development in areas of sensible dunes and beaches;
3. Create laws that contemplate the analysis of alternatives of demographic growth, the evolution of productive activities and the planning of land use in coastal zones.
4. Review the criteria for the establishment of the setbacks zone, in critical areas along the coastal zone and, the development of specific legislation for them;

Long term results IV

Elevate the consciousness of the local communities, the private sector and other intervenient on the effects of coastal erosion and its social and economic impact.

Short term results IV

Endow the community with theoretical and practical knowledge on coastal erosion and common ways of combating/ mitigating it.

Activities to develop

1. Elevate the sensibility of communities and users of the coastal zone on the integrated management role of coastal natural resources in the mitigation of impacts of climate change;
2. Increase the encouragement of the communities and involved parts in the use of coastal zones on the impact of erosion and deforestation in micro-climate change in the region.
3. Involve the local communities in the discussion of the good practices in fighting and preventing erosion.
4. Encourage the population to abandon fisheries techniques that contribute for the destruction of sensible eco-systems such as weed, coral reefs, etc.
5. Evaluate abilities to be implemented by communities and recommend improvements.

Risks and Barriers

The population's habits and the inertia for change of attitude in view of emerging problems can constitute a bottleneck for the positive implementation of activities of the project. The emergence of extreme adverse climatic events during the construction of protection barriers. The loss of access to beaches on the part of local communities and the tourists themselves. They can also be barriers for the implementation of the project.

The implementation of a policy of setbacks zones to face the problem certainly will face great acceptance difficulties for the part of owners and the population, since it implicates the 'misappropriation' of property part of some critical zones.

IMPLEMENTATION

The implementation of activities listed in this project will be of the responsibility of MICOA, through the Sustainable Development Centre for Coastal Zones and the National Directorate for Environmental Coordination in partnership with fisheries and higher education institutions.

BUDGET

Table 1: Proposed budget (USD 2,000,000) by project expected result (USD).

ITEM	Expected Result	Expenses with the personnel	Goods	Services	Capital expenses	Total result
1.1	Systematized and mapped knowledge on eroded and erosion prone areas, causes identified and social and economic impact of the problem evaluated;	67 000	251 250	125 000	42 000	**485 250**
1.2	Elaborated Technical and Scientific framework of measures for the fight and/or mitigation and the respective chronogram of activities as well as a preliminary evaluation of the intervention costs;	52 720	131 800	125 000	19 000	**328 520**
2.0	Identified appropriate small, medium and long scale intervention techniques, including participative mechanisms in the solution and or mitigation of erosion problems;	52 720	263 600	250 000	14 000	**580 320**
3.0	Practical knowledge conveyed and techniques for the fight/mitigation of erosion shown to affected communities;	82 480	41 240	25 000	6 000	**214 720**
4.0	Identified main gaps of the legal and institutional framework on erosion and proposed sceneries of appropriate institutional arrangement for the present reality and, amendment and contributions recommended for the current legislation	52 720	39 540	25 000	14 000	**131 260**
5.0	Identified and tested effective methodology for the transmission of knowledge on erosion and ways to prevent, mitigate and combat and community adoptable processes.	102 720	77 040	25 000	56 000	**260 760**
	Total Group	**410 360**	**804 470**	**575 000**	**211 000**	**2 000 830**

Table 2: Proposed annual budget per project expected results (USD).

ITEM	Expected Result	Year 1	Year 2	Year 3	Year 4	Year 5
1.1	Knowledge on eroded and coastal erosion prone areas systematized and mapped, causes identified and problems of social and economic impact evaluated	145 575	109 181	84 919	72 788	72 788
1.2	Elaborated Technical and Scientific framework of measures for the fight and/or mitigation and the respective chronogram of activities as well as a preliminary evaluation of the intervention costs;	98 556	73 917	57 491	49 278	49 278
2.0	Identified appropriate small, medium and long scale intervention techniques, including participative mechanisms in the solution and or mitigation of erosion problems;	174 096	130 572	101 556	87 048	87 048
3.0	Practical knowledge conveyed and techniques for the fight/mitigation of erosion shown to affected communities;	64 416	48 312	37 576	32 208	32 208

4.0	Identified main gaps of the legal and institutional framework on erosion and proposed sceneries of appropriate institutional arrangement for the present reality and, amendment and contributions recommended for the current legislation.	39 378	29 534	22 971	19 689	19 689
5.0	Identified and tested effective methodology for the transmission of knowledge on erosion and ways to prevent, mitigate and combat and community adoptable processes.	78 228	58 671	45 633	39 114	39 114
	Total Year	**600 249**	**450 187**	**350 145**	**300 125**	**300 125**

MOZAMBIQUE

NAPA PRIORITY PROJECT 4

FOURTH ACTION: MANAGEMENT OF WATER RESOURCES UNDER THE FRAMEWORK OF CLIMATE CHANGE

INTRODUCTION

Mozambique has got a reasonable potential of both superficial and underground water resources. The country has got about 103 river basins, 13 of which have a drainage area of over 10,000 km^2 from north to the south, namely: Rovuma, Messalo, Lurio, Ligonha, Licungo, Zambezi, Pungoe, Buzi, Gorongosa, Inharrime, Govuro, Limpopo, and Incomati. Other relevant basins with a drainage area below 10.000 km^2 are Montepuez, Monapo, Save, Umbeluzi and Maputo. In addition, in all 9 river basins shared with other neighbouring countries, members of SADC, Mozambique is downstream.

According to available data, the total available flow is of about 216 km^3/year of which 100 km^3 corresponding to 46% is generated in the country and the remaining 116 km^3 come from neighbouring countries. So, the largest quantity of water draining superficially through rivers come from outside Mozambique, something that requires a loft of effort in strengthening management norms or regulations to manage river resources with neighbouring countries.

Significant progress has been recorded, according to available information in relation to the installation of early warning systems close to river courses of Umbeluzi, Inkomati, Limpopo, Buzi, Pungoe, Zambezi and Licungo, for considering that they are flood prone river basins. Relations arrangement between institutions linked to natural disasters management have been established, but they still do not meet the country's crying needs. Presently, the hydrometric network under operation is made up of 100 stations. Monitoring the quality of water is done only in the country's southern region and in sporadic measures elsewhere.

A phenomenon that occurs in low level events (drought) is saline intrusion, having as a result soil salinity, with negative reflex ion on agricultural and livestock activities, and also on the conservation of biological species. On the other hand, the low level of the rivers can led to a situation of loss of vegetation coverage, leaving a nude soil susceptible to erosion.

In events of high superficial flow (floods), there's in fertilization of soil with the displacement of nutrients by water. Various activities in different (agricultural, livestock, fisheries, transport, etc) sectors are interrupted.

Another phenomenon that deserves attention, with negative environmental impact, is pollution of river waters. The pollution of river waters represents a risk for the conservation of biodiversity. During a strong rainfall, the superficial flow of waters containing solid particles and other particles which are carried away by the flow running towards the rivers, turning river water more polluted and improper for human consumption, thus deteriorating the living conditions of communities that use the water for various activities. On the contrary, the available water for various community activities during the dry season is scarce resulting in loss of crops and animals, the shortage of water for cooking, dish-washing, personnel hygiene, etc.

The Southern Regional Water Board, ARA-Sul, in its (2004) Business Plan, recognizes the lack of both human and institutional capacity to monitor the environmental quality of water.

The National Water Policy (PNA) approved by the Mozambican government in 1995 introduced various reforms in the integrated management of river resources. The inclusion of water management

aspects in environment laws, land laws approved in 1997, mining laws, fisheries laws, forestry and wildlife in subsequent years, are examples of the impulse that the approval of that policy brought about. The policy was reformulated and in its new version emphasis is given to the issue of floods and the objectives are to prevent human loss of lives and minimize the negative social and economic impacts of floods - loss of goods, damage in public and private infrastructures, disturbances of the social and economic life. In relation to drought, the policy envisages the following objectives: to prevent situations or hunger and the shortage of drinking water in rural areas resulting from generalized drought and minimize the impact of drought in the water supply in urban areas, agriculture and cattle. Concrete actions are proposed for the achievement of these objectives.

Mozambique is situated downstream the main river basins that cross through it, the quality and quantity of water that reaches the country depends on the activities carried out in countries through which the rivers cross before entering the country. These factors place challenges to the country ranging from the creation of water storage capacity in periods of abundance for later use in periods of shortages and the creation of technical and institutional capacity to manage floods, drought and actively participate in negotiations of shared water resources, clearly indicating the national needs in terms of minimal and ecological flow of rivers for the maintenance of eco-systems and the strengthening of floods early warning systems. In these negotiations, it's advisable that consideration should be given to the climate change once the vulnerability evaluation reports, particularly the Inter-governmental Panel Report, indicate that water constitutes the resource that is likely to generate future conflicts as a result of climate change.

RATIONALE OF THE PROPOSED ACTION

Mozambique has been suffering from the effects of extreme climatic changes of hydrologic nature, caused by low or high level superficial draining of waters through river basins that cross the country. The magnitude of the effects of drought and floods that have affected the country is extremely frightening by the fact that the control and evaluation system of the behaviour of the river water levels in the country's hydro graphic basins not to be at the demanding level.

According to existing studies, most of the river basins in the country's southern region are characterized by low water levels during the dry season and high levels during the rainy season according to studies carried out. The central and northern regions, the river water levels are regular. This shows the influence that climate factors have on the availability of water resources. In this context, the control and evaluation of the available water quantities in and for the country are of paramount social, economic and environmental importance. That's because it acts as a tool for adequate decision making in mitigating natural disasters derived from variations of the level of river waters of the country's existing hydrological basins which on their turn are the result of weak or strong rainfall

The control of the variations of the water levels of the hydrological basins demands an extensive and dense hydrometric network and hydro-meteorological network, as well as a technical assistance by professionally sensitive and responsible man. On the other hand, the evaluation and analysis of the water availability, taking into account climate variability, demand a long, continuous and safe series of hydrometric and hydro meteorological data. In addition to being few, the 100 hydrometric stations under operation show quality problems and, therefore, the quality of collected data is also poor. There's a need to expand and increase the density of the hydrometric stations, to improve the sharing of information related to water management among the various development sectors according to the National Strategy for Water Management (ENGA). The ideal for the country is to expand from 100 to 300 hydrometric stations and from about 800 to 1,000 pluviometric stations.

In terms of hydraulic infrastructures, there are only four dams distributed in the order of one by one of the main hydrological basins in southern Mozambique, built to control floods, irrigate and supply people with water. However, there's also the problem of lack of qualified personnel to deal with

control and evaluation aspects of the river levels using modern technology. Now, capacity building in the technical viewpoint, following the evolution of technology used in the control f river waters will enable the improvement of the reduction of negative impacts resulting from low or high level of river levels.

Various sectors of national development have their actions conditioned to the availability of water resources; therefore, it's of paramount importance to involve different sectors in the management of water resources, especially under the framework of impact reduction of extreme hydrological events.

DESCRIPTION

Objectives

Improve the level of control and evaluation of the river waters, for the reduction of drought and flood impacts along the hydrological basins resulting from the increase or drop in the river water levels, from excess or lack of rain in the basin. This action aims specifically to:

1. Evaluate the control systems of the river water levels for a greater precision in the forecast on drought and floods.
2. Promote the improvement of the river water level control system through technical and capacity building of personnel linked to the collection and processing of hydrological data.
3. Elevate the systematic control level of river water quality.

Expected results

Long term results I

Human and material damage deriving from floods in hydrological basins minimized as a result of climate factor variability.

Short term results I

Improved control system of the river water levels compared with the level of neighbouring countries.

Activities to develop

1. Do the measurement of the transport of sediments in the main basins for the timely detection of morphological change of rivers.
2. Develop hydrological methods in all key hydrological basins.
3. Programme and do the regular calibration of equipment in hydrometric stations.
4. Promote the creation of basin committees in the country's biggest hydrological basins, with particular attention for those where irregularity of water levels are often recorded.
5. Identify and prioritize the training needs in different relevant issues such as: negotiations techniques, the holding evaluation studies of vulnerability and the integrated management of rivers.
6. Train technicians according to prioritized needs.

Short term results II

Improved and updated hydraulic infrastructures in the regional context.

Activities to develop

1. Identify the various conditions and needs along the rivers which require different specific solutions;
2. Build river water level protection and control dikes close to the hydrological basins in flood and drought prone areas;
3. Build protection barriers against saline intrusion close to estuaries;

4. Rehabilitate hydraulic infrastructures;
5. Reinforce the construction of new infrastructures in already identified locations by the water entities;
6. Reinforce the capacity of installed equipment operators close to the existing infrastructures through dam observation and maintenance courses.
7. Draw and implement infrastructure maintenance activities
8. Elaborate regulation instruments on security in the dams and other hydraulic infrastructures.

Short term results III

Improved the system to disseminate information

Activities to develop

1. Facilitate access to date through the Website close to the water board authorities (ARA's) and other potential users.
2. Extend the use of community radios in the publication of information in the appropriate format to the community level.
3. Create an exchange mechanism of information between SADC-HYCOS and other telemetric stations with the databank system of the ARA´s.
4. Promote civic education campaigns close to the different groups, particularly those that carry out activities in the basins.

Short term results IV

Sharing of improved water course between Mozambique and neighbouring countries.

Activities to develop

1. Identify and prioritise river basins in which evaluation studies of vulnerability and adaptation are to be carried out.
2. Carry out studies in, at least, three river basins and conceive their integrated management plans;
3. Evaluate signed Agreements of Shared Resources;
4. Create a telemetric network and transborder hydrologic models.
5. Harmonize the format of the databank and the collection of data with neighbouring countries through the holding of regional seminars;
6. Formulate comprehensive agreements of water use in shared river basins under the guidelines of the SADC protocol.
7. Promote a continuous negotiation, for the establishment of regulations and agreements of water shared courses between countries of the southern African region.

Long term results V

Protected biodiversity along the main hydrological basins

Short term results V

Controlled national river water pollution

Activities to develop

1. Prepare a national inventory, on the extension of humid land, riverside ecosystems, with a base to guarantee its long term protection;
2. Evaluate the environmental status of some river basins where evasive species occur and propose recovery measures;
3. Establish the minimum ecological river water level in all hydrological basins;
4. Hold a continuous evaluation of water quality, and weed;

5. Identify source of water pollution and formulate appropriate control measures;
6. Strengthen effective water quality control measures;
7. Ensure the holding of environmental impact studies in water use projects, according to Mozambican Environment Law (LAM);
8. Draw more detailed and comprehensive emergency plans on water quality and protection of riverside ecosystems;
9. Promote community encouragement campaign for the practice of activities that do not harm ecological environment of hydrological basins;
10. Consolidate the close institutional collaboration between the regional water boards or ARAs and MICOA in the elaboration and observance of measures to protect water resources in the environmental perspective.

Risks and Barriers

The success in the implementation of this action depends on:

- The active participation of various intervenient sectors including the communities;
- The timely allocation of necessary resources for the holding of the listed activities;
- The level of responsibility and professionalism of affected readers in the stations and collected hydrological data processing centres.
- The strict collaboration between the intervenient.

IMPLEMENTATION.

The implementation of listed activities in this action will be up to the DNA and ARA's, being institutions endowed with the management of water resources, in the installation and monitoring component of hydrometric stations; design and selection of appropriate models for the evaluation of water resources.

The National Institute of Meteorology (INAM) will have the responsibility of installing and monitoring hydro-meteorological stations, particularly the pluviometric component. It's also the entity responsible for the collection, processing and analysing climatological data.

The control of quality and pollution of water, the protection of riverside ecosystems (Biodiversity), elaboration of instruments to regulate the control f aquatic pollution, and guarantee its implementation will be of the responsibility of MICOA (UGA and DNGA),

MOPH, MAE, MCT, MINT, MEC, MINAG, MDefense, MFisheries, NGO's, and Research Institutions.

BUDGET

The budget is estimated at about 2,000,000 USD according to listed activities and operational costs.