

**ASCLME
NATIONAL TRAINING PLAN
FOR
MOZAMBIQUE**

by

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SUMMARY

The report presents capacity building needs of research and teaching institutions in marine sciences of Mozambique. The survey was carried out through visits and questionnaires to heads of departments and directors of institutions.

In Mozambique there are 5 technical institutions in marine sciences: INAHINA – National Institute for Hydrography and Navigation, IIP- National Fisheries Research Institute, CDS_ZONAS COSTEIRAS - Centre for Sustainable development of Coastal Zones, CEPAM – Centre for Marine And Coastal Research of Pemba and UEM Eduardo Mondlane University with the Natural History Museum and the Inhaca Island Marine Biology Research Station. In addition, the Eduardo Mondlane University also carries out research and teaching in marine sciences through two institutions: Superior School of Marine and Coastal Sciences of Quelimane, and Department of Biological Sciences, Faculty of Science.

An Institution dealing with meteorology and climatology in Mozambique is the National Meteorology Institute (INAM). This is a central institution in this field given the current prevailing issues of climate change and variability in which its resources are used to prevent both losses of human lives and goods. INAM has the mandate of dealing with monitoring and application of meteorological services in the field of aerospace and marine environment.

These technical institutions carry out research in several fields of marine sciences (coastal management, marine biology and oceanography and meteorology and climate) and their mandates sometimes covers also rivers, waters reservoir and climate and environmental disasters.

Staff in these institutions are undergoing formal training for Master of Science and PhD degrees according to their needs and resources available. However, all institutions require more trained staff members to postgraduate level.

Tourism is a recent and fast growing activity in Mozambique and has been playing an important role for poverty alleviation. The government recognized its role and created the ministry of tourism which has developed the tourism policy and strategy. However, there is no technical institution dealing with tourism development in Mozambique. Tourism issues are still dealt at central level by the staff at specific directorates at the Ministry of Tourism. The Ministry of Tourism has since about 1980 a training hotel for basic workers in Tourism sector which operated in Maputo.

The teaching of marine sciences at Eduardo Mondlane University is carried out at undergraduate and Master of Science Level. Undergraduate Courses at Department of Biological Sciences have a 3 year duration (new course curriculum started in 2010) and graduate students in Marine Coastal and Aquatic Biology. The Superior School of Marine Sciences of Quelimane offer currently undergraduate degree courses with in Marine Ecology, Oceanography and, Marine Chemistry.

At the master level, the Department of Biological Sciences of Faculty of Science offer a Master Degree in Aquatic Biology and Coastal Ecosystems with 8 teaching modules in the 1st year of the course and a research dissertation in the second year of the course. The course started in 2008 and is now in its 3rd edition, having enrolled 39 students. The first post-graduated Master of Science students finished in 2010.

The Superior School of Marine Sciences offers Master degrees in Sustainable Aquaculture, Oceanography, Marine Biology and Fisheries Management, these courses started in 2010.

All courses in marine sciences at Eduardo Mondlane University have components of oceanography taught to the students.

The teaching and training in tourism sector in Mozambique has started recently in 2005 and restricted to a few schools while the tourism potential is high throughout the country. Both professional (by two professional training high schools – Comercial Institute fo Maputo and Professional School of Massinga) and high education training started in 2005 through 2007 (by Superior School of Hostelry and Tourism of UEM, Instituto Superior Dom Bosco (a catholic community initiative) and the Faculty of Tourism and Informatics of the Catholic University of Mozambique) , following the approval of the tourism industry which recognizes the potential socio-economic importance of sector Mozambique.

In terms of capacity building needs, the institutions have distinct needs according with their mandates. Those with mandate for oceanography (INAHINA, IIP and Superior School of Marine Sciences) request more for more training in instrumentation (handling of oceanographic instruments –CTD, Rosettes, and Tide gauges) and data processing of hydrographic and bathymetric data. The Fisheries Research Institute (IIP) also identified needs of capacity in the planning and management of research cruises.

The Centre for Sustainable Development listed in their capacity needs more techniques and training in environmental education, coastal zone management, climate changes, GIS, Geoprocessing and Territorial Planning, advanced statistics and environmental statistics. CDS-Zonas Costeiras also identified training in English and Advanced English as priority for their staff.

CEPAM is a newly established institution and their staff require capacity in aquaculture, marine biology research, research proposal, sampling techniques of the marine environment, statistics and data processing, scientific diving. The Inhaca Island Marine Biological Station has currently two staff members with University training (Botany and Oceanography). However, it plans to recruit new staff in staff and would require more basic training of initiation of research: statistic, research proposal writing, statistics and sampling techniques.

Although INAM has its own department of professional training which guide the capacity building and training needs of the institution, INAM is still in great need of training opportunities at graduate and post graduate level to its staff in the fields of Meteorology, Oceanography, Marine Oceanography, Climate and Environment in order to be able to fulfill its mission

In most of these institutions, some staff members are enrolled in Master of Science and PhD programs. However, all institutions identified training needs to the degree of Master of Science and PhD in some specific research fields of marine sciences and have staff ready to be enrolled.

In the field of Marine Biology the Fisheries Research Institute, the Superior School of Marine Sciences, Centre for Marine and Coastal Research requested training in taxonomy of fish and fish larvae, culture of marine species and capacity in the field of genetics of marine species.

In the course of this study we were unable to get the exact data on the training and capacity building needs required for the Tourism Sector. However, training of teachers to BSc level for teaching in the professional education has been identified by the Ministry of Education as a major priority, while for high education institutions may require the capacity building needs in terms of training of their staff to post graduate levels (MSc and PhD) and the development of Postgraduate courses on Tourism

All the technical, research and teaching institutions in Oceanography, Climate and Meteorology and Marine Sciences require opportunities to have their staff attending regularly the research cruises. There is need to invest in the socio-economic field (tourism sector), in which there are few professional and high education institutions mushrooming, but which require massive efforts in terms of capacity and training needs in order to position tourism services in Mozambique to the world standards.

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1. RESEARCH & TECHNICAL AND EDUCATION INSTITUTIONS IN MARINE SCIENCES (OCEANOGRAPHY AND COASTAL SCIENCES)

1.1. LISTING, MANDATES AND STRUCTURE OF INSTITUTIONS

1.1.1. INAHINA (NATIONAL INSTITUTE FOR HIDROGRAPHY AND NAVIGATION)

It is a technical and scientific institution created by the Decree No. 40/89 of 5 December 1989 of the Council of Ministers. It was created to enable the secure navigation of waters under national jurisdiction as well as research and use of waters and living and non living resources. INAHINA is under the Ministry for Transports and Communications. It is a juridical institution with administrative and financial autonomy.

The aims of INAHINA are to carry out technical and scientific activities in the waters under national jurisdiction in order to ensure navigation safety and provide assistance to research in the marine resources.

INAHINA has its headquarters in Maputo and may open delegations at different parts of the country.

Mandates of the INAHINA:

- a) Coordinate, promote, develop and follow up activities carried out in the field of hydrography, physical oceanography, safety in marine navigation, nautical cartography and maritime signalization.
- b) Ensure that the maritime, river and lake waters are properly equipped with functioning lighthouses and signalization with buoys to prevent accidents in waters under national jurisdiction.
- c) Study the hydrographic regime of the harbours and coastal waters and promote studies to establish the Zero Hydrographic Level of Mozambique.
- d) Promote and apply legislation and connected instructions with the activities linked with their obligations and competences.
- e) Edit, distribute, exchange, and sell nautical charts and associated documents to assist the navigation in waters of national jurisdiction.
- f) Assist technically competent institutions in the matters of maritime law of the interest of Mozambique
- g) Provide the necessary assistance to assist maritime navigation
- h) Must be mandatory consulted about project of new dredging operations, operations of maritime hydraulic and other operations which may alter the hydrographic regime of harbours and banks.
- i) To collect taxes of lighthouse operation services and of the regulation and compensation magnetic needles in order to ensure the financial sustainability to maintenance and renovation of the devices assisting to navigation.
- g) Establish liaison with similar foreign institutions, in order to deal with common issues of technical-scientific nature.

h) Provide specialist services which are not necessarily in their mandate, when requested for, by national and foreign entities, through payment of tariffs approved by the competent institutions.

i) To promote the training of their specific technical and management staff needed to carry out their activities.

INAHINA has a broad source of income which includes funds provided by the state budget, donations of national and foreign institutions, tax from assistance to navigation charged at to ship agents and owners, tax collected for regulation and compensation of magnetic needles, payment of specialist services provided to national and foreign entities which are not in the plans and programs of the maritime responsibility, income from sale of maritime charts, hydrographic tables and nautical documents.

The INAHINA has 4 Departments;

The Department of Hydrography,

This department has the tasks of study propose and execute activities of hydrographic survey, cartography, design, oceanography, applied informatics to hydrography and of repair and maintenance of mechanic, electric and electronic equipment used at INAHINA

Department of Navigation

This Department has the mandate of study, promote and carry out work in the field of aid to navigation, nautical documents, navigation systems, rules of maritime signaling, and of regulation of magnetic needles.

Department of Maritime Signaling

This department has the task of:

- a) Elaborate, inspect, and enforce plans and programs of installation and maintenance of aid to navigation in the navigation ways in waters of national jurisdiction
- b) Propose improvements and changes to be introduced in the signaling system according with the navigation needs and technical progress.
- c) Maintain the uniformity in all issues of maritime signaling in the national territory, in compliance with the international conventions to which the Republic of Mozambique belong.

Department of Administration

This department has the tasks of:

- a) Ensure the administrative, financial and patrimonial action, staff management and means of transport of INAHINA
- b) Ensure the conservation, maintenance and repair of the INAHINA facilities (infrastructures)
- c) Carry out activities which are integrated in the scope of their roles or other which are determined by superior entities.

The institution has different departments: consulting (consisting of the Director and Heads of Departments) and technical councils (consisting of the Director and head of Departments of Hydrography, Navigation and Technical.

Research Infrastructure in the field of hydrography and oceanography and navigation are: A large Buoy Deployer ship (named Bazaruto), six small vessels equipped with equipment to scan the maritime sea floor, and six tide gauges.

The National Institute for Hydrograph and Navigation (INAHINA) is the Mozambican Institute, responsible for the installation, and maintenance of the tide gauge stations, as well as for the acquisition, processing, archiving and dissemination of the sea level data. The data processing is being done according to the international standards.

The network of sea level stations in Mozambique consists of thirteen stations from which, only three (Maputo, Nacala and Pemba) are operational. To overcome this actual tide network state of affairs, in 2005, Mozambique has upgraded two GLOSS stations in Mozambique (Pemba and Inhambane), during the ODINAFRICA III project in collaboration between INAHINA, SANHO and POL. The project was funded by IOC, and the main propose of this upgrade was to records Sea Level for Monitoring Coastal Zones and Impacts of Global Change in Africa providing near real-time observations of sea level. These two GLOSS stations were operational, since 2005 to the beginning of 2006. Bearing in mind the difficult on maintenance (all the spare-parts come from U.K.), as well as, the absence of a regular maintenance by a local operator, these two stations, are nowadays partially operational. To face with this, the INAHINA has started with the procedures to contract, two local operators, who are supposed to perform the basic maintenance of this equipment (Canhanga and Nehama 2006). INAHINA has also acquired two other digital tide gauges, which are intended to be installed in Maputo and Beira Harbors (Canhanga and Nehama 2006).

Figure 1 illustrates the map of Mozambique, as well as all the gauge stations, including those which are still not operational. The tide gauge network, was primarily installed to provide aids to navigation to the vessels sailing to and from the harbors, and not for scientific proposes. Presently there is a need (a part from the need to make the previous network fully operational), of installing the new tide gauge, in places that can bring more conclusive results in the research fields (Canhanga and Nehama, 2006)

Table 1. The list of this stations and the corresponding coordinates of their tide gauges

Station Name	Location latitude; longitude	Tide gauge model-SN	Year of Installation	Responsible
Maputo	25 ^o 58.5' S; 32 ^o 34.2'E	OTT R20 - 20102	1994	INAHINA
Nacala	14 ^o 27.8' S;	OTT R20 -	1995	INAHINA

	40° 40.8'E	20102		
Pemba	12° 58.' S; 40° 29.3'E	OTT R20- 20102	1992	INAHINA

The tide gauge data are recorded hourly for those stations which are equipped with floating gauges. These data are available in both digital and hardy copy format at INAHINA. A copy of the data is sent to Portuguese Hydrographic Institute, in Lisbon and till 2005, it was used to produce a tide table for several harbors in Mozambique. The tide table is available in INAHINA in printed version.

Data from GLOSS stations (those stations which are equipped with digital radar tide gauges) are recorded in every fifteen minutes. These data are sent to the world data center through the following address sites:

http://www.pol.ac.uk/ntslf/sadata_african_ntslf_radar.php?code=1001&span=1 for Pemba station and

http://www.pol.ac.uk/ntslf/sadata_african_ntslf_radar.php?code=1002&span=1 for Inhambane station

1.1.2. NATIONAL FISHERIES RESEARCH INSTITUTE (IIP)

The Fishery Research Institute evolved from a Mission for Biocenology Studies and Fisheries in Mozambique which was established in the 1960's. This Mission was extinct in 1976 and replaced by the Fishery Research Service, under the National Directorate for Fisheries. It had three operational areas: industrial fisheries, people's fisheries and fishery research. In 1979 these services were transformed into the Institute for Development of Fisheries with 3 departments: fishery research, fishery technology and aquaculture. In 1984 the Institute for Development of Fisheries was transformed into the current National Institute for Fisheries Research (IIP, a Portuguese acronym)

The IIP falls under the Ministry of Fisheries. It is the largest aquatic research institution in Mozambique. It has 140 staff members in the whole country. 44% have basic qualifications, 16% are technicians with pre-university qualifications and 24.6 are technicians with a University degree. The Fishery Research Institute has currently at central level 4 research departments, 2 departments for assistance (administration) and 2 assistant sectors (repartitions). At provincial level it has 10 delegations, of which 9 are under operation.

The responsibility of the IIP is to carry out research and advise the government, the industry, communities and the public in issues concerning the sustainable exploitation of fishery resources in Mozambican waters, including fresh water resources, in order to attain the objectives stated in the fishery policy which is "to ensure the sustainable utilization of the fishery resources and the viable economic growth of the private sector.

The IIP has its own research strategy for 2008-2012. The discussion of the s research strategy was initiated in 2004 with internal discussions and was approved in its

Consulting Council Meeting in September 2007 and submitted to the Consulting Council of the Ministry of Fisheries for Approval in December of the same year.

The vision for the research at IIP:

The fisheries research must be holistic, integrated and ecosystem-based, and that research results must be largely disseminated at all levels, including local level, used by the fishery sector and serve to promote a sustainable utilization of fishery resources.

According to the research strategy the IIP has to comply with several government and international documents. The most relevant are the Master Plan for Fisheries in Mozambique and the Fisheries Policy. Research activities of the IIP must concentrate on the fishery resources that are;

- a) Currently exploited and have significant importance for the country (economically or in terms of their contribution for the subsistence of people.
- b) Which has a potential economic or food significance and are currently underexploited
- c) which are currently under heavy exploitation (artisanal fisheries at Maputo Bay, Inhambane Bay and Inhassoro, Beira Bay, Chiloane Island, Mozambique Island and Pemba Bay).

The research activities of the IIP must be permanent and are conducted to ensure the:

- a) collection and processing of statistical data of catch and effort and sampling activities
- b) periodic evaluation of the most important resources
- c) Provide recommendations on the management measures for the adequate utilisation of the resources.

In addition, IIP must comply with the Strategic plan for the artisanal fishery sector (PESPA). In this regards, the environmental question must be dealt with in all activities of the development of the artisanal fisheries in order to achieve the objectives of absolute poverty reduction.

Also in relation with the PESPA, the IIP has the mandate to monitor the artisanal fishery, collect all biological and socio-economic data, , develop knowledge of the biological state of the resources available to the artisanal fisheries, including the identification and development of methods and adequate techniques for the specific stock assessment, and develop a statistical system which has to be expanded in order to cover all the coastal provinces (including water reservoirs of Tete and Lake Niassa, and strengthen the capacity to compile and analyze the data at IIP.

In its strategic objective for fishery research (2008- 2012) the IIP stated that it needs to develop an integrated fishery research, ecosystem-based, through the strengthening and improvement of the existing working area and expansion of its activities to new areas

The fundamental objective of the fishery research is the scientific management of the fishery research in waters under jurisdiction of Mozambique.

Objective 5 of the organic statute define fishery research, namely:

- a) evaluation of the fishery research and recommended management measures of the fisheries;
- b) study of the aquatic environment, oceanography and limnology
- c) culture of aquatic species
- d) dissemination of research results and transference of technology in close liaison with other national and international organizations
- e) Development and dissemination of methods for scientific analysis and documentation related with the aquatic resources and environment and their rational exploitation.

There is also a need to improve the knowledge of the ecological relations in the aquatic environment in order to understand the connections between the environment and the fishery resources, and the impact of fisheries and other activities (transport, tourism, conservation, mineral exploitation, river flow management (regulation), and agriculture) on the ecosystem, in which the fish is one of the components.

The Department of Aquatic Environment (Oceanography and Limnology) of the IIP has experienced in the last 5-7 years an intense activity. It was involved in planning and implementation of oceanographic research cruises. Members of this department have also participated as observers in international cruises carried out in Mozambican waters, as managers on research cruises organized through bilateral cooperation and also on cruises prepared during regional research programs.

The participation on these cruises helped the IIP to discover gaps in expertise of their staff:

- On planning and management of oceanographic research cruises and their sampling operations;
- Handling, calibration and use of oceanographic research instruments (CTD, Rosettes, etc);
- lack of preparation of lab assistants on techniques for water analysis and handling of research instruments on board of cruises.

Most of these gaps of knowledge are caused by scarcity of research equipment at IIP. The technicians are not exposed sufficiently to use and handling of the instruments and sometimes need to be updated on technological advances in instrumentation.

IIP does not have a lab for processing water samples obtained during research surveys in the aquatic environment.

The Department of Resources for artisanal fisheries has the following tasks:

1. Monitoring the activity of artisanal fisheries,
2. Production of statistics of artisanal fisheries and,
3. Evaluate the status of the resource exploitation

1.1.3. CDS-Zonas Costeiras (CENTRE FOR SUSTAINABLE DEVELOPMENT OF COASTAL ZONES) – MICOA.

The CDS – Zonas Costeiras is a public institution under the Ministry for Coordination of Environmental Affairs and has administrative autonomy.

The CDS- Zonas Costeiras has a mission to coordinate and promote studies and their dissemination, technical advice, training and development of pilot activities of management of marine, coastal and inland (Lake) Environment which contribute for design of the policies and formulation of legislation which promotes the development of coastal zones.

The CDS- Zonas costeiras has its headquarters in Xai-Xai. The Minister for Coordination of Environmental Affairs may create and propose the creation of observation stations at any location of the country, having consulted other relevant sectors.

Mandates of the CDS- Zonas Costeiras

- a) To coordinate and promote studies, monitoring and data collection pertaining to the management of coastal zone, including establishing a databank.
- b) Coordinate, promote and formulate processes towards integrated planning and implementation of good practices on management of coastal, marine and lake and water reservoirs
- c) Promotion and implementation of experimental and demonstration activities for conservation, protection and sustainable use of coastal resources;
- d) Provision of technical assistance to government institutions and other organizations in the area of management of integrated coastal management and sustainable development of coastal zones
- e) Collection, compilation and dissemination of technical and scientific information relevant for the rational utilization, sustainable development and preservation of coastal zones;
- f) Promotion and implementation of awareness and training programs including empowering the communities in the sustainable use of natural resources of coastal zones

Competences of CDS- Zonas Costeiras

- a) to promote the integrated planning and implementation of good practices of environmental management in collaboration with other relevant institutions

- b) to promote and provide assistance in the monitoring of the state of environment and sustainable use and conservation of natural resources and biodiversity of coastal zones
- c) collect, analyze and evaluate the information about the state of environment and the use and conservation of natural resources, including the development of database
- d) Promote and implement, in conjunction with other relevant entities, experimental and demonstration activities for protection and integrated sustainable management of environment of coastal zones
- e) Provide assistance in the development, with other relevant institutions, of awareness programs and of programs of enhancing the community power in the domain of integrated and sustainable management of the environment in the coastal zones;
- f) Provide training to relevant institutions in the field of environmental management and use of natural resources in coastal zones
- g) Provide advice services in the environmental issues of coastal zones
- h) Help training programs on the field of environment.

CDS-Zonas costeiras has two departments and two repartitions (sections), managed by a Director:

- a) Department of Coastal Development
- b) Department of Training and Dissemination
- c) Repartition (Sector) of Documentation and Information
- d) Repartition of Administration and Finances

There are two collective organs functioning at CDS-Zonas Costeiras:

- a) Collective of Direction
- b) Technical Council

The Department of Coastal Development has the mandate of

- a) Carrying out studies and plans on integrated coastal development of marine and coastal environment and lakes and water reservoirs.
- b) Developing models of coastal management to promote the sustainable development of coastal zones of the country
- c) Proposing strategies of integrated development in sensitive ecosystem areas
- d) Proposing programs of integrated management of coastal ecosystems including strategies for their conservation
- e) Elaborating and analyzing comments and reports and recommendations towards the sustainable development of coastal zones
- f) Promoting and coordinating research programs related with the management of the marine, coastal, lake ecosystems and of water reservoirs
- g) Implementing pilot projects of management of coastal, marine and lake ecosystems and water reservoirs

- h) Elaborating comments and evaluations on environmental impact studies and assist in the revision , enforcement and monitoring of the impact assessment evaluation process

The Department of Training and Dissemination has the mandate of

- a) Promoting training, education and awareness programs about the coastal , marine, lake environments and water reservoirs;
- b) Promoting capacity building courses and specialization courses in aspects of management of marine, coastal and lake environments
- c) Promoting and participating in the definition of strategies of training and awareness in aspects of integrated coastal zone management
- d) Disseminating experiences and research results and pilot activities of management of coastal, marine and Lake Environment.

The Repartition (Sector) of Documentation and Information has the functions of:

- a) maintain updated documents and bibliography about the coastal, marine and lake environments;
- b) establish an archiving systems of documentation and update regularly its inventory
- c) produce and circulate regularly newsletters containing a list of the most recent documents
- d) Establish mechanisms of execution and exchange of information with other institutions and facilitate the access and consultation of existing documents and bibliography.
- e) Create and maintain and updated databank of aspects related with the management of coastal, marine and lake environments
- f) Update the information systems in use in the institution
- g) Elaborate magazines and newsletters on activities developed in the area of coastal management

1.1. 4 CEPAM (CENTRE FOR RESEACH OF MARINE AND COASTAL ENVIRONEMENT) – PEMBA- MICOA

CEPAM, (full name in Portuguese: Centro de Pesquisa do Ambiente Marinho e Costeiro), was created by the degree 16/2007 of 16 April, with the designation CEPAM. It is a public institution of juridical personality, and administrative autonomy. It is a national institution with the headquarters based at Pemba City, Cabo Delgado Province and is under the management of the Minister for Coordination of Environmental Affairs. It may create delegations and field stations in the country.

CEPAM has the following tasks:

- a) Carry out programs of applied research about marine and coastal ecosystems to improve the understanding of their capacity and correspondent solutions.
- b) Contribute for the implementation of the integrated planned actions and implementations of good practices of the management of marine and coastal environment in the country
- c) Implement, in partnership with other sectors, experimental and demonstration activities, of conservation and sustainable use of marine and coastal ecosystems and disseminate their respective results
- d) Carry out monitoring and regular evaluation of the marine and coastal ecosystems
- e) Recommend measures to reinforce the protection of the marine and coastal environment
- f) Carry out capacity building programs in the protection and sustainable use of coastal and marine ecosystems
- g) Assist and carry out training programs in the field of environment
- h) Establish relations of scientific exchange with national and foreign institutions which carry out research activities of the marine and coastal environment
- i) Provide services of technical assistance in the field of coastal and marine ecosystems.

CEPAM has a large facility at Pemba City, Chiuba, which consist of wet and dry labs, herbarium, Museum, administrative building, auditorium, restaurant, dorms and houses. CEPAM also now four ski boats (build on fiberglass: of medium size and two small sizes, all equipped with outboard engines.

CEPAM is managed by a Director and Deputy Director. The Management Council is formed by a Director, Deputy Director, Administrator (Manager), Head of Departments (not yet defined) and Head of Sectors.

CEPAM has also an advising technical's and scientific council, which is chaired by the CEPAM Director. This council consists of competent specialists in the field of management of marine and coastal environment representing the following institutions:

- a) Ministry for Coordination of Environmental Affairs (MICOA),
- b) National Institute for Fisheries Research (IIP)
- c) Centre of Sustainable Development for Coastal Zones (CDS Zonas Costeiras)\
- d) Heads of Departments of Research Areas of CEPAM

This Scientific Council has the mandate to:

- a) comment on the research program of the marine and coastal environment
- b) comment on technical and scientific aspects about environmental matters of competence of CEPAM
- c) Analyze and comment about the content of education, training and environmental capacity building programs to be implemented by CEPAM
- d) Analyze technical and scientific rules prepared by CEPAM or by other institutions which will be related with CEPAM research areas.

- e) Propose to the CEPAM Management any changes to be carried out in the research programs;
- f) Comment on the results of the research programs carried out by CEPAM.

The profit of CEPAM consists of funds from State Budget, Profit generated by use of their resources, profit obtained by consultancy services and from sale of publications and other materials produced by CEPAM, donations or subsidies provided by public and private national or foreign entities or any other sources allowed by law;

The CEPAM facilities occupy an area of 2524 m² and have the following buildings:

Item	Name of the block	Área (m ²)
1	Administration	275.60
2	Teaching room	272.30
3	Laboratory	466.50
4	Workshop for boat	119.60
5	Auditorium	200.70
6	Museum & Library	527.00
7	Kitchen and Restaurant	514.24
8	Laundry	416.23
9	Security check room	30.07
10	Dormitory	365.70
11	Houses	138.79
	Subtotal	2524.00
12	Covered walkways	345.40
13	Parking	398.66
	Total	3268.19

Currently only the Museum and Library are not working. The boat workshop and adjacent areas have been adapted to extend the lab and to accommodate the AquaPemba, Lda which is establishing a Nuffield Center of Aquaculture.

The current research priorities of CEPAM consists of collection of baseline data about the intertidal resources including seaweed and sea grasses, fish and mangroves as well as the oceanographic description of the Mecufi region. In this regards, CEPAM has carried out surveys of sea grass and seaweed, marine invertebrates between Mecufi and Pemba. Surveys of fish biodiversity of Pemba bay and erosion rates and sediment transport along the coast of Mecufi have also been carried out. Currently CEPAM is conducting surveys on the zonation, species composition and diversity of Mangroves at Quionga Bay, Rovuma River. CEPAM is also developing the data base systems to store this data for future analysis of spatial and temporal trends. In 2011 CEPAM will start research experiments with cultivation of mollusks. CEPAM will also start scientific studies to monitor coral reefs and sea turtles using its own revenues.

In terms of management and finances, CEPAM has been receiving state budget since 2008. CEPAM has also received investment projects from treasury funds and in implementing a project to establish a laboratory. Lab supplies, chemicals and consumables including tables, and laptops have been acquired.

CEPAM is also establishing a communication network which includes a server.

The human resources of CEPAM consist of 22 staff members. In terms of qualifications, four staff members have university degree, two staff members have pre-university qualifications, two staff members have basic secondary education and 14 staff members have primary education. Staff members with University degree were recruited in 2009. One is currently managing the CEPAM (the Director), with a MSc degree, two are in the field of marine and coastal research and one work in the field of Aquaculture. The last technician was recruited in September 2010.

CEPAM is currently developing its Research Strategy, since it is a new established institution. Among other issues, the research strategy of CEPAM is based on the following strategies:

Strategic Plan for the Environmental Sector 2005-2015 which define as priority actions the promotion of monitoring of the quality of the environment as priority aspects such as the management of natural resources, biodiversity conservation through formulation of protection programs of marine and fish biodiversity as well as the improvement of capacity of research institutions.

The strategy for Science, technology and innovation of Mozambique (2006) which consider that research areas and programs those which warrants the environmental sustainability of the management of coastal areas, climate changes and the environment as the socio-economic impact. Medium term goals are the conservation of marine and coastal ecosystems and the research on biodiversity conservation though an inclusive approach to prevent and control the destruction of habitats, the extinction of species and propagation of exotic species.

The Government Plan for the period 2010 – 2014 for the environmental sector considers the success in fighting of absolute poverty as an assumption for environmental conservation, through the rational use of natural resources based on planning and correct control of human activities. The five year governmental plan defines as strategic objective to strengthen the institutional and legal framework for the sustainable use of natural resources and maintenance of biodiversity. It defines as priority actions, ensuring the sustainable and rational use of natural resources, the implementation of a national strategy for conservation of biodiversity and promotes research, good practices and utilization of clean technologies in the sustainable management of natural resources.

The Mission of CEPAM

To produce scientific knowledge of excellence needed for the sustainable management which ensure the use of biodiversity and of the marine and coastal environment for the socio-economic development of Mozambique.

The Vision of CEPAM

Achieve the Excellency in the development of sustainable scientific solutions and innovations for the conservation of marine and coastal biodiversity of Mozambique.

Ecosystem management is holistic. It recognizes the connections between air, land, water, and all living beings.

The following principles must be followed in ecosystem management:

- Encompass a holistic view, including the whole system, not just parts.
- Focus on interrelationships among the components of the environment, and between living and non-living things.
- Ensure balanced consideration of the natural environment, society, and economy.
- Use natural geographic units such as watersheds.
- Incorporate the concepts of ecological sustainability.
- Respect for species other than humans and for generations other than the present.

Improved ecosystem management depends on understanding the impacts of management actions (fisheries, habitat, and nutrient/contaminant management) in concert with other drivers of change such as climate, water levels, and species invasions

Ecosystem models are being used to assess the compatibility of multiple objectives and identify critical knowledge gaps. There is recognition that goals set separately and not as part of an ecosystem framework are unlikely to be compatible and likely to be counter productive

Ecosystem science provides managers with more information about the factors that affect the abundances of particular species. This information should help managers and clients understand better the need for conservation during unfavourable environments, as well as the opportunities for fishing during favourable conditions.

There is a definitive requirement for the development of an ecosystem science framework to better understand and monitor the interactions between the ecosystem components and changes resulting from increased human pressures

Short term actions (within 2 years) have the objective of consolidation of the current knowledge and scientific program and creation of specific products for immediate use.

Medium term actions (3-5 years) are the creation of multi-functional scientific products as the consolidation of knowledge is acquired and scientific gaps are resolved, resulting in great rewards.

The CEPAM strategic research objectives are:

Strategic objective 1.

Promote applied research on biodiversity including endangered species, marine ecology and studies of the marine and coastal ecosystems and their dynamics in order to contribute for the conservation, promotion of use with scientific sustainability.

Short term actions: - within 2 years:

- to carry out and compile baseline studies about the marine biodiversity of territorial waters in the whole country including fish, invertebrates, seaweeds, sea grasses and mangroves;
- to carry out and compile baseline studies and elaborate and implement monitoring programs about the endangered species, particularly for whales, dolphins and marine turtles, manta rays and whale sharks;

Medium term actions- until 5 years

Based on an ecosystem approach:

- Elaborate research programs and monitor the biodiversity and environmental impacts of resources marine available to commercial exploitation;
- Elaborate ecological research programs and studies of dynamics of the main resources in the ecosystems available to commercial exploitation and develop proposals of management scenarios;
- Elaborate and implement monitoring programs about the endangered species particularly, whales, dolphins and marine turtles and develop proposals of management scenarios;
- Elaborate monitoring programs of indicator species for the ecological equilibrium and of the effect of global climate changes on the biodiversity and marine ecosystem.

Research strategy 2

Promotion of research on the aquatic environment and their role on the transport, distribution of marine and coastal biodiversity and marine and ocean productivity;

Short term goals:

- Describe the oceanography of the aquatic environment, particularly the behaviour of marine currents and the circulation patterns within the territorial marine waters;
- Describe the role of the marine currents in the distribution and transport of marine and coastal biodiversity and ecosystems equilibrium.

Medium term:

- Establish mathematic models for the circulation in the main areas of interest of marine and coastal biodiversity and ecosystems, and their influences in the connectivity between ecosystems;
- Elaborate monitoring programs of the main oceanographic parameters that influence directly the ecosystems productivity and their resilience capacity against extreme environmental events;

Research Strategy 4

Promote research and development of culture experiments of fishes, mollusks and marine invertebrates, including studies of phytoplankton and zooplankton which supports these initiatives;

Short term actions - within 2 years

- Carry out and compile baseline studies on scientific methods for culture of common species of fish, mollusks, crustaceans and test and promote experiments in captivity;
- Carry out studies and experiments about the main local species of phytoplankton and zooplankton at locations of culture, to be used as feeding source for the Mari culture;

Medium term actions – within 5 years

- Elaborate research and monitoring programs of the biology and ecology of the main species selected for captive culture;
- Develop methods of artisanal culture of species for the fishing communities;
- Elaborate research programs for aquaculture in coastal lakes and wetlands;
- Elaborate a monitoring program of the level of pollution of water adjacent to semi-intensive and intensive culture stations of fishes and crustaceans;

Strategic objective 5

To Promote robust physical and digital system for storage and processing, exchange and management of information in order to contribute for the adequate provision of the scientific information base needed for the management of development, education and environmental awareness;

Short term actions

Electronic Information Systems

- Establish a communication digital network for data transport between CEPAM and outside;
- Establish a database about the marine and coastal biodiversity of the country including oceanographic data and meteorological database

Library

Establish a physical library; initiate the establishment of a virtual library about the marine and coastal environment and their connection with an electronic information system of CEPAM;

Museum

Establish a system of collection and treatment of specimens of fish and marine invertebrates for their storage in the Museum

Medium term activities

- Develop a reference collection and a team of taxonomists which could deal with the biodiversity;
- Map the distribution of marine and coastal biodiversity and their conservation in the territorial waters including the production of guides of marine and coastal biodiversity

Strategy VI

Promote national, regional and international partnerships and cooperation in order to implement research programs, develop human, financial and logistic resources.

1.1.5 SUPERIOR SCHOOL OF MARINE AND COASTAL SCIENCES – QUELIMANE - EDUARDO MONDLANE UNIVERSITY

The Superior School of Marine and Coastal Science of Quelimane (ESCMC) was created in 2005. It is mainly a teaching department in marine sciences offering Licenciatura degrees training in Marine Biology, Oceanography and Marine Chemistry. It started in 2011 with three Master of Science courses in Sustainable Aquaculture and Oceanography. The courses have duration of two years including one year of course work (modules) and one year dedicated to dissertation research.

It is located in Central Mozambique, near important fishing areas of Mozambique and one of the largest rivers of Mozambique (the Zambezi River). The school of Marine and Coastal Sciences of UEM is the largest marine oriented research and teaching institution of Mozambique. It takes about 100 undergraduate students in Marine Sciences each year. Besides its role in teaching, the school offers also extension course capacity building courses on coastal management to the communities and authorities.

Vision of the Superior School of Marine and Coastal Sciences of UEM (ESCMC)

The sea and coastal zones must be used and exploited in a sustainable way, benefiting the communities and contributing for the national and regional development.

Strategies of the ESCMC

To fulfill its mandates, the following development strategies:

- To become a dynamic unit with a simple, capable and efficient for training, research and extension, working for the coastal development of the country and region, in the areas of : marine and coastal ecosystems, marine and coastal biodiversity, fisheries and aquaculture; coastal and mineral resources; marine services and safety; integrated coastal zone management; coastal engineering; coastal and marine archaeology;
- Create and consolidate a team of lecturers and researcher with high scientific, pedagogic and professional competence, capable of be involved in innovation.
- Exploit synergies between existing Departments, Faculties and Centers at Eduardo Mondlane University, at the existing institutions of Mozambique and the region, to achieve its objectives.
- To build continuously capacity of the staff (human resources) integrated in the active life, promoting specialization and permanent training.
- To promote national and regional exchange between experts and professionals in the issues of sea and coastal zones to improve their knowledge in the management of marine and coastal ecosystems.

The ESCMC strategy includes contacting the varied sectors of activity in the management of marine and coastal resources, providing short- training programs to the interested parts, especially those involved in their exploitation and management.

The Superior School of Marine and Coastal Sciences have two departments working currently: an Academic Department and an Administrative Department:

The Academic department is the Department of Marine Sciences includes the research and teaching areas of Oceanography, marine ecology, fisheries and aquaculture. This department coordinates teaching, research and extension activities in Oceanography, as the science which studies the oceans as an environment for marine wildlife and living and non living resources, as well as aspects of fisheries and aquaculture.

This department deals with physical, chemical, biological and geological aspects of the oceans as well as aspects of fisheries exploitation and practice of aquaculture, taking into account the integrity of the associated ecosystems.

This department intends to carry out studies on methods of fisheries assessment and estimates of stock assessment in the country. The department also intends to carry out studies of efficient and ecological healthy fishing techniques, methods of preservation of quality of fisheries catch, of techniques of aquaculture of fish, crustaceans, mollusks and sea grass, among others.

The Department of Administration and Finances of the Superior School of Marine and Coastal Sciences, manages the human resources, the budgets and revenues of the School, following norms of public fund management.

- This department prepares detailed monthly and annual balance of the budget use of the schools and organizes the administration activities, the preparation of events, patrimony, communication and archives of the school;

This department also carries out all other activities of their competence which are defined by high hierarchy.

Undergraduate (Licenciatura) degrees courses offered at ESCMC and admission

Students are admitted to the courses of Oceanography, Marine Biology, Marine chemistry and Marine Geology. Admission requirements are similar to those of Eduardo Mondlane University, which is a certificate with completed pre-university in the section of natural sciences with biology or equivalent.

Master Courses offered at ESCMC and admission

The admission terms to Master Course of ESCMC have been regulated by the Deliberation nNo. 03/CUN/2003, of the regulation of Masters Courses of Eduardo Mondlane University. Candidates are scrutinezed by an admission committee which consider the following criteria:

Candidates admitted to master courses must have concluded the first cycle of the higher education in Natural Sciences and Engeneering, based on the marks of the conclusion of their first cycle (Licenciatura or Bachelor of Science) and professional experience.

Master Course programs at ESCMC have the duration of two years. The first year is course work with a total of 60 credits and consists of specialization modules which provide the students with the necessary base for the understanding of the practice and purposes of the application of the course. In the second year, the students carry out the research project and write a dissertation which is also worth 60 credits.

Research projects of the ESCMC

The ESCMC of Eduardo Mondlane University develops research in the marine and coastal studies and application of knowledge for the use and exploitation of the marine and coastal resources. On -oing projects are funded by national and foreign agencies such as the Open Research Fund of UEM and National Research Fund of the Ministry for Science and Technology of Mozambique.

Implemented research projects are:

1. Socio-economic evaluation of artisanal shrimp fishery in the north part of Sofala Bank
2. Ecological and socio-economic evaluation of industrial shrimp fishery in the north part of Sofala Bank
3. Building of a dam at Inhamussua District, Inhambane
4. Microalgae culture for biodiesel production
5. Preliminary evaluation of the behaviour of shrimp larvae and juveniles at the estuary of Bons Sinais River, at Inhassunge, Quelimane;
6. Salt Intrusion and their effect on the abundance and distribution of post-larvae of juvenile shrimp at Bons Sinais Estuary
7. Shrimp Aquaculture;
8. Aquaculture of the african catfish;
9. Tides and Salinity monitoring at the irrigation area of Sombo, Chinde;
10. Production of electric power through tides;
11. Construction of dam at Baixo Licungo;
12. Application of satellite remote sensing for the integrated management of marine and coastal ecosystems
13. Construction of a bridge at the locality of Inhangome - Quelimane;

In cooperation with local and foreign institutions the ESCMC participate in the following projects:

- Training and research project SOED- South Ocean Education and Development, in cooperation with Canada, Brasil, Ministry of Fisheries and Fisheries Research Institute
- Trainig Project NOMA (Norad's Program for Masters Studies) in cooperation with Norway
- Project of development of marine sciences in Mozambique, which is part of a NUFFIELD program. Cooperation with Uniked Kingdom.
- Participation in the regional Initiative for Science and Education (WIO_RISE, Western Indian Ocean Regional Initiative in Science and Education) with Tanzania and South Africa.

Short Training course run by ESCMC

Coastal management courses oriented to people living at some coastal districts of Zambezia Province and Beira City have been organized and are:

Short term duration on Methods of Scientific Research (May-June 2009).

Course of Management of Liquid effluent in Coastal Municipal Cities and Towns, August-September 2010.

1.1.6 DEPARTMENT OF BIOLOGICAL SCIENCES – FACULTY OF SCIENCE- EDUARDO MONDLANE UNIVERSITY

The Department of Biological Sciences (DBS) is a teaching department of the Eduardo Mondlane University which completed last year (2010) 25 years of existence. It was opened in 1986 as faculty of Biology and in 1999 it became a Department of Biological Sciences when it was unified to the large faculty of Science. It currently (since 2010) teaches 4 undergraduate courses (to the licenciatura level), one of which is directed to Marine and Aquatic Biology. This department also teaches since 2008 a Master of Science Course in Aquatic Biology and Coastal Ecosystem offering postgraduate training opportunities to Mozambican students in the country.

The teaching staff of the Department of Biological Sciences is vast (about 30 lecturers: 8 with PhD degrees and 15 with MSc degrees and few assistant lecturers with Licenciatura degree). In the field of marine sciences and coastal there are 5 PhD staff and 7 MSc graduated staff in the field of Marine and coastal sciences. The research fields are mainly in marine biology and ecology: ecology of commercial shrimps in their nursery grounds, marine botany (mangroves, sea grasses and seaweeds taxonomy, ecology and utilisation, marine mammal biology and ecology, coral reef research, Mari culture of marine invertebrates and aquaculture).

In terms of teaching and research infrastructure the Department has just moved to a new building with more than 8 teaching rooms, 6 labs (most to be equipped). One research ecology lab is operational. The Department also owns a research boat and 2 vehicles for field research and student trips.

Capacity Building Program in Marine Biology and Oceanography and Marine Research Programs

The Department of Biological Sciences has been running, since 1989, a long term capacity building program initially in Marine Biology with the aim of enhancing the research and teaching capacity of the Department of Biological Sciences. Lately since 2005 the Department added the field of Oceanography. This program had as an output the training of 4 staff members as PhD in Marine and Aquatic Biology and 2 PhD in Oceanography (one to the Department of Physics and another of the National Institute of Meteorology (INAM)). In addition to these about 8 Master of Science degrees have been obtained in marine Biology. This program has also contributed for the establishment of the Master Course in Aquatic Biology and Coastal Ecosystems.

Among the research highlights the Department of Biological Sciences includes the participation in two regionally funded European Union projects between 2005 and 2008: TRANSMAP and PUMPSEA, which boosted regional in east Africa and international collaboration.

1.1.6. INHACA MARINE BIOLOGICAL STATION (EBMI) – FACULTY OF SCIENCE - EDUARDO MONDLANE UNIVERSITY

This Station was built in 1947 by the University of Witwatersrand and annexed to the Eduardo Mondlane University in 1976 when the Institute for Scientific Research of Mozambique was extinct, because most scientists were expatriated.

Inhaca Marine Biology Research Station is located at Inhaca Island and is a Department of the Faculty of Science of Eduardo Mondlane University. The station used to be a research hub of other departments of Eduardo Mondlane University, mainly the departments of biological sciences and Department of Physics. Physics and therefore, it served as a research station and training facility for national researchers and students and had for many years a resident biologist. Since 2003 the EBMI became a Department of the Faculty of Science.

The research infrastructures of the EBMI includes a Museum with a large and representative collection of marine and terrestrial species, dive equipment and compressor, labs with basic material for sampling and treatment of specimen vouchers, a well equipped library with updated literature (field guides of the region), salt and fresh water running system, in the past it also had a weather station. This weather station stopped working around the year 2000. Since 1990 this Inhaca Marine Biological Station has produced several BSc dissertations (more than 80) in marine and coastal sciences, more than 20 MSc thesis dissertations (from Mozambique and abroad) and 5 PhD (including one from Mozambique, one from Netherlands and one from Sweden) in Marine Sciences, mostly Biological Sciences.

Recently, the EBMI has been also used to run PhD training courses in tropical marine biology (one course occurred in January 2010 by the University of Gothenburg, Department of Marine Biology), with about 16 students and five professors from Sweden.

Lecturers from Eduardo Mondlane University in the field of Marine Biology also offered some day courses to the PhD students.

Besides its functioning as a research hub, the station is also responsible for conserving two marine reserves and three terrestrial reserves at Inhaca and Portuguese Island and therefore, it has a law enforcement staff as well.

In terms of sections it has a section dealing with management of reserves, administration, support for conservation, and a science section (with technical staff). The station has also capacity to house visitors with three rooms and two large dorms.

In the period between 2005 and 2008 the Station worked also as a regional training facility when WIOMSA financed the training of young scientist in Marine Ecology Courses. In addition, a students of 3 universities in the course on biology: Eduardo Mondlane University, University of Witwatersrand and University of Namibia, under the program SANTED (Southern Africa tertiary Education project funded by the Norwegian Government) of training run by a body of lecturers of the three universities for a period of two weeks each year. This promoted exchange of expertise and experiences. Focus of training at Inhaca Island was in Marine Biology and Marine and Coastal Ecosystems Currently the research station and its facilities have been used for field practices of the undergraduate courses run at the Departments of Biology, Physics and Geology of the Faculty of Science. The facilities of the station are also widely use by privately run and international high schools of Maputo for initiation training and awareness about marine environment during short terms (2-4 days trips).

1.1.7. NATURAL HISTORY MUSEUM- UNIVERSIDADE EDUARDO MONDLANE

The Natural History Museum of Eduardo Mondlane University was created in 1913. It aims at carrying out natural history research of wildlife.

The Mission of the Museum is: “to preserve and disseminate the natural heritage of Mozambique, promote scientific research of biodiversity and promote the formal and informal environmental education and awareness to the citizens, contributing for the use and sustainable management of natural resources and ecosystems of Mozambique.”

The Natural History Museum is organized into two Departments (Natural Sciences and Museology) and the Repartition of Administration and Finances.

The Museology Department is responsible for managing the display of the public natural and ethnographic exhibitions of the Museum, to manage the taxidermy section (which prepares and maintain animals for exhibits) and for deal with visitors of the Museum, and is also responsible for management of the Museum library. The Museology Department has 12 staff members, one is the researcher in Museology, seven staff who takes care of the Museum and manages the visiting scheme. Other three staff members carry out the taxidermist work and maintain condition of the animals in display.

The Museum has just created in 2011 a Unit to be engaged in Environmental Education to deal prepare and program all with education materials and needs of visitors and schools visiting the Museum. Currently, two staff members are assigned to this unit and are assisted by a post-doc fellow from University of Aveiro and by the Department of Natural Sciences.

The Department of Natural Sciences deals with research on natural history of the species and conservation of ecosystems (in the areas of mammalogy, ornithology, entomology, malacology, herpetology, ichthyology and other wildlife groups) . The Natural Sciences Department is also responsible for the maintainance, curation and cataloguing of the fauna collection of insects, birds, mammals, reptiles, amphibians, and terrestrial and marine invertebrates. This department also carries out extension services in its field of operation when requested by third parties. This department has four staff members (two researchers and two technicians – one with pre-university training and one with basic primary education). This Department also produces scientific material to supply to the Museology Department.

Research focus in this Museum has evolved over time changed across several areas throughout its existence. The Natural History Museum became part of Eduardo Mondlane University in 1975 when the Institute of Scientific Research of Mozambique was extinct. Entomology was once the main research area in the 1950 and 1960's. However, in the 1950-1970 the Museum gathered research collections of fishes and marine invertebrates collected in Mozambique by Prof. Smith (from JLB Smith Institute of Ichthyology). The Museum holds large also collection of birds, marine and terrestrial mammal, reptiles, fishes, marine invertebrates and insects of Mozambique. The Museum is in process of producing an inventory of this collection, since the original records files were lost in the 1970's. Presently only the bird collection has been fully catalogued electronically and the entomology collection has been partially catalogued. There is an on going process to organize and catalogue the remaining collection and also to curate the specimens.

Currently, since 1995 the Museum has been carrying out both research in terrestrial, marine and coastal ecology and biodiversity in the areas of wildlife, marine mammal ecology, bushmeat, poaching, socio-economics of artisanal fisheries, marine ecology.

Of highlights is the research in marine mammal biology and ecology and conservation in Mozambique (dugongs and dolphins) in Maputo Bay, Bazaruto Bay, Ponta do Ouro and other regions of Mozambique coast. The research extends into the sustainable dolphin tourism at Ponta do Ouro . Also in the marine environment the Museum was once involved in marine inventories at Ibo Island and Vamizi Island at Quirimba Archipelago,

The other area were the Museum has been active for long time has been the wetland ecology, and particularly the ecology and Conservation of Wattled Crane in the Marromeu Buffalo Reserve and Zambezi Delta. Now the Museum is also carrying out studies of buffalo population ecology at Conservation areas of Mozambique (Gorongosa National Park and Marromeu Buffalo Reserve), focusing on the impacts of wetlands, poaching and population recovery.

The Museum has also been involved in the research cruises organized by IIP (on board of the Research Vessel Fridjof Nansen (in 2007), to collect specimens of marine biodiversity, marine mammals and bird species of Mozambique.

The Department of Natural Sciences has also produced educational and awareness materials in association with partners in the following issues: mangroves, seagrass, and marine mammals.

The Museum was once involved in coordination of the African Coelacanth Ecosystems program (ACEP) in Mozambique in 2003-2005.

The Museum has been carrying out conservation associated research in conservation areas: Quirimba National Park, Bazaruto Archipelago National Park, Gorongosa National Park, Marrromeu Buffalo Reserve, Maputo Special Reserve, Machangulo Elephant Development Project and Ponta Do Ouro Partial Reserve. Chimanimani National Reserve and Vilanculos wildlife sanctuary over the last 15 years.

The Museum was also involved in the research of the extent of the human-wildlife conflict in Mozambique within the National Wildlife Inventory carried out in 2008.

The Natural History Museum (NHM) is also part of the Dugong.org , which is a regional initiative with Centre for Dolphin Studies and Marine Mammal Scientist of University of Cape Town (Dr. Ken Findlay) to conserve the last viable population of dugong in western Indian Ocean.

This dugong population is currently at the Bazaruto Archipelago area and only 40% of it is within the marine protected area. The Natural History Museum has been involved in dugong research since 2001 in Mozambique, and particularly in Bazaruto Archipelago where it has been involved in population assessment of dugongs through aerial surveys and also mapping of seagrass beds communities (between 2003- 2007). Recently (in 2011), the Natural History Museum is carrying out the assessment of the extent of dugong mortality through by-catch in artisanal gill net and beach seine fisheries practiced around Bazaruto Archipelago, on the promotion of dugong awareness and consultation with the tourism operators on alternative livelihood for fishing communities around Bazaruto Archipelago National Park with funding from US Marine Mammal Commission. The NHM is also implementing a socio-economic assessment of the fishing communities of the mainland around Bazaruto Archipelago within the scope of a pilot project which is being implemented by the Ministry for Coordination of Environmental Affairs and the UNEP/CMS Secretariate for the Memorandum of the Protection of Dugongs and their Habitats

1.1.8. NATIONAL METEOROLOGY INSTITUTE – INAM

The first national weather and astronomical institution was effectively established in 1909 (with the name Santos Rodrigues Observatory) to coordinate the collection of the meteorological data of all weather stations as well as all astronomical data was later named as a National Meteorological Services until 10 of October 1989, when by the ministerial decree no. 30/89 of 10 of October it was transformed into the National Meteorological Institute (INAM). This decree gave this institution a legal status with administrative and financial autonomy, subordinating it to the Ministry of Transport and Communications.

Having inherited from the National Meteorological Services an inefficient infrastructure and almost no technical staff, INAM invested in the training of human resources within training institutions of the country and from abroad. INAM also invested to increase the coverage of weather stations to get them to the level of year 1975 (The current coverage is 75%)

Through government efforts and international partners INAM is emerging to a new era of improving the quality of services provided, in order to reduce the vulnerability and safety of lives and goods.

INAM is an institution betting to be the pillar of the sustainable development and on the struggle against absolute poverty.

The Mission of INAM is “to promote the exploration of climate based resources”

The INAM has the mandate of: “ Coordinating the meteorological activity within the country in all their domains, namely: in meteorological exploration and applications, with emphasis for climatology, agrometeorology, aerospace, marine and monitoring of the air quality.

It competes to INAM to provide advice to the Government, in the field of meteorology, about the international relations, namely cooperation agreements and international Conventions

The activities of INAM are:

- a. Plan, install and ensure the functioning of the weather stations;
- b. Plan, install and ensure the functioning of air quality working stations in collaboration with government entities responsible for the environmental management;
- c. Promote the undertaking of observations on board of planes and ships and plan the exchange of meteorological information (bulletins) with the international meteorological community;

- d. Promote the acquisition, standardization, calibration, construction and repair of meteorological instruments;
- e. Record, collect, archive, analyse and publish the results of observations;
- f. Promote and ensure the functioning of Centers for Weather Analysis and Forecasting for general and specific objectives;
- g. Carry out studies and investigations in the domain of meteorology and climatology;
- h. Participate in the impact assessment studies which involve the atmosphere field of the climate system, in coordination with the government entity in charge for environmental management;
- i. Support technical studies in the field of meteorology carried out by other institutions;
- j. Collaborate in the teaching of meteorology at other institutions;
- k. Promote the application of norms and terminology in accordance with the established by the World Meteorology Organization

INAM has the vision of “ Working toward the most accurate weather forecasting and that no one in this vulnerable land be caught by surprise by weather and climate events.”

Organic Structure of INAM

INAM is managed by a National Director and a National Deputy Director and has 8 departments each with his responsible head and staff and specific functions: Department of Observations, Department of Weather Analysis and Forecasting, Department of Informatics, Department of Administration and Finances, Department of Maintenance and General Assistance, Department of Professional Training, Department of Studies and Meteorological applications.

The Department of Observations has the following specific functions

- a. Promote the installation of climatic, agrometeorological and hydrometric stations and sites for surface and altitude networks, in accordance with the development plans of INAM and other sectors;
- b. Collect, verify, record and archive the results of observations;
- c. Define procedures and observation methods and carry out the control of quantity and quality of observations.

The Department of Informatics has the following functions:

- a. Ensure and carry out all automation work necessary for the development of the Institute;
- b. Build up database files, correct and maintain them updated;

- c. Implement and manage all the built systems;
- d. Carry out system analysis and elaborate softwares;
- e. Organize and maintain the archives of database files;
- f. Answer different requests of technical information.

The Department of Weather Analysis and Forecasting has the following functions

- a. Coordinate the activities of weather analysis and forecasting at all weather forecasting centres;
- b. Develop studies for the determination of numerical methods of analyses and other which contribute for the improvement of the quality of the forecast;
- c. Develop forecast studies at short, medium and long terms for general and specific uses, covering all areas of interest, particularly agriculture, aviation and shipping;
- d. Carry out post-mortem studies in order to improve the forecasting;
- e. Articulate with other institutions responsible in the diffusion of meteorological information in a way to ensure that the forecasts and bad weather bulletins are transmitted as quickly as possible;
- f. Elaborate studies of synoptic climatology;
- g. Define the principles of functioning of meteorological telecommunication and coordinate its activity.

The Department of Professional Training has the following functions:

- a. Define a permanent, global, structured training policy that is sufficiently consistent for organization qualification activities, capacity building and periodic updating (recycle);
- b. Plan and execute training actions for the different professional categories;
- c. Collaborate with other institutions in the training of their technical in the field of meteorology;
- d. Coordinate and control all training activities of the Institute staff carried outside in other teaching and training stations.

The Department of Administration and Finances has the following functions

- a. Ensure the execution of all general expedient and the necessary assistance to the correct functioning of INAM;
- b. Elaborate the budget of revenue and expenses of INAM and submit to the evaluation of the Administrative Council;
- c. Carry out the charging of revenues of INAM and promote its safe deposit;
- d. Carry out the management of funds of the budget of INAM and carry out the expenses in accordance with the legal norms;
- e. Ensure the implementation of the regulation of services of state patrimony;
- f. Carry out accountancy processes of the management and submit to the appreciation of the Administrative Council;

- g. Carry out the management of all staff of INAM, including the expedient of admission and promotion of staff, as well as that related with the constitution, modification and extinction of rights and situations of staff, employing and enforcing the legal formalities.

The **Department of Maintenance and General Assistance** has following functions:

- a. The maintenance and repair of all electric and electronic equipment;
- b. The maintenance and repair of telecommunication equipment;
- c. The calibration, standardization and maintenance of meteorological instruments;
- d. The maintenance and servicing of several instrument such with mechanic watches;
- e. The articulation with the Department of Professional Training, of training actions for the staff members of this department;
- f. Execute general and specific work of locksmith and carpentry;
- g. Ensure the maintenance of the buildings and furniture of INAM and execute building works;
- h. Ensure the management and maintenance of vehicles;
- i. Propose the acquisition of equipment and material needed to the sector;
- j. Take care of the garden and yards of meteorological instruments, clean and decorate the external part of the buildings

The **Department of Studies and Meteorological Applications** has the following functions:.

- a. Develop studies in all domains of application of meteorology, particularly for agriculture, shipping/navy, aerospace, environment and solar radiation;
- b. Develop numerical models which contribute for the improved assistance to each domain of a application of Meteorology.

Collaborations of INAM

INAM collaborates with several national and international technical institutions: Eduardo Mondlane University, National Directorate for Water Affairs, Climate Agency and Environmental Implications, US Geological Survey, Famine Early System Network and National Institute for Disasters Management

TOURISM SECTOR

The tourism sector in Mozambique had the most delayed development in Mozambique due to the 16 years of civil war which destroyed all road networks and restricted access to tourist destination and decimated the wildlife of the protected areas which were already very famous through out te 1960s. Therefore, compared with the neighbouring countries tourism after 1975 was the minor sector in the economy. However, after a peace agreement was signed in 1992 and following the first democratic general elections Mozambique experiences a growing demand of tourism to which the country was not prepared in terms of infrastructure and staff. Recognizing its potential for growth, job creation and its role poverty alleviation at both urban and rural areas, the government of Mozambique created the Ministry of Tourism in 2000 . This ministry was created by the Presidential decree No1/2000 of the 17th of January 2000 and the Presidential Decree no 9/2000 of the 23rd of May 2000 defined its areas of responsibility that include the administration, direction, planning and execution of policies in the following areas: tourism activities; hotel and tourism industry and related activities; and conservation areas designated for tourism.

To carry out its areas of responsibility and its mandate, the Ministry of Tourism is organized according to the following activity areas:

- a) Tourism activities;
- b) The hotel and related industry;
- c) Conservation areas designated for tourism;
- d) Tourism inspection.

At national level, the Ministry of Tourism has the following bodies:

National Directorate for Tourism (DINATUR),
National Directorate for Conservation Areas Designated for Tourism (DNAC),
Tourism Promotion Directorate (DPT),
Planning and Co-operation Directorate (DPC),
General Inspection of Tourism (IGT),
Human Resources Department (DRH),
Administration and Finance Department (DAF),
Legal Department (DJ) , and the
Transfrontier Conservation Areas Coordination Unit (ACTF).

At local level, the Ministry of Tourism is represented by the Provincial Directorates of

Tourism, with representative directorates or offices at district level expected to be introduced in the future. In January 2004, the Ministry of Tourism established Provincial Directorates of Tourism in all the provinces, except for Maputo city and province. The institutions governed by the Ministry of Tourism are:

a) National Tourism Fund (FUTUR), responsible for the promotion of the development of tourism through marketing, technical and financial assistance to local operators, training and provision of assistance on undertakings of tourism interest.

b) Hotel Escola Andalucia, offering basic training in the areas of front office, food and beverage and housekeeping. This hotel was the only technical institution operated to train basic workers in hotels since 1984 and continued operating until 2003. After that the School Hotel Andalucia

MITUR currently employs about 600 people; this includes central staff as well as staff in the Provincial Directorates and in the National Parks and Reserves (400).

There is not yet any technical institution dealing with tourism development in Mozambique, and all planning is currently carried out through consulting agencies.

2. CURRENT RESEARCH STAFF IN EACH RESEARCH INSTITUTION AND QUALIFICATIONS

The table below summarizes the number and qualification of research staff at the research and teaching institution in the field of Oceanography and coastal environment

Table 1. TEACHING/TRAINING INSTITUTIONS IN MARINE SCIENCES IN MOZAMBIQUE

Institution	Department	Pre-University or Technical Education	Licenciatura degree (BSc.Honors)	MSc Degree	PhD Degree
INAHINA	Department of Hydrography (Oceanography: Currents & Tides)		7	2	0
INAHINA	Department of Navigation (Cartography)	3	4	2	0
IIP – Fisheries Research Institute	Department of Aquatic Environment		6	2	1
IIP- Fisheries Research Institute	Department of Resources Accessible to Industrial Fisheries	1	3	2	1
IIP- Fisheries Research Institute	Department of Assessment of Resources Available to Artisanal Fisheries	4	10 (8 are enrolled in MSc training)	6	0
MICOA	Centre of Sustainable Development for Coastal Zones	7	6	1	0
MICOA	CEPAM (Centre for Coastal and Marine Research)		3	1	0
Eduardo Mondlane University – Faculty of Science	Inhaca Marine Biological Station – EBMI	2	1	1	0
Universidade Eduardo Mondlane – Faculty of Science	Department of Biological Sciences (marine and coastal sciences)		2	7	5
Universidade Eduardo Mondlane	Natural History Museum	7	0	2	1
Universidade Eduardo Mondlane	ESCMC – School of Marine and Coastal Sciences		9	8	1

2.1. INAHINA (NATIONAL INSTITUTE FOR HIDROGRAPHY AND NAVIGATION)

The departments of Hidrography of INAHINA has a total of Nine staff members. Seven staff with Licenciatura degree (equivalent to BSc Hons), all trained in Physical Oceanography, most trained at Eduardo Mondlane University Physics Department . Two hold MSc degree in Physical Oceanography trained overseas (Norway).

The Department of Navigation has nine staff members, three hold technical education (pre-university) with training in cartography. Four hold Licenciatura degree in the fields of Geography or Oceanography. Part of these staff members are currently under training for MSc in Geographic Information System in United Kingdom. Two staff members have MSc degree in Geographic Information Systems and Cartography.

2.2.IIP (FISHERIES RESEARCH INSTITUTE)

2.2.1 Department of Oceanography and Aquatic Environment

The Department of Aquatic Environment of IIP has Seven technical staff members, five at the office in Maputo and two are working at the IIP delegations at the Sofala and Zambezia Provinces. In terms of training the staff members of this department 5 have BSc training in Oceanography, one in Biology and one, in Geography. Those who already holds MSc degree have training in Oceanography and Limnology (in Canada and South Africa). The two staff members currently undertaking MSc training are registered at Eduardo Mondlane University, Department of Biological Sciences.

2.2.2 Department of Resources accessible to Industrial Fisheries

The Department of Resources accessible to Industrial Fisheries of IIP has 11 staff members, of these, one technical has pre-university training, three staff members have licenciatura degree, two staff members have MSc degree and one staff member has PhD degree.

Currently one staff member with licenciatura degree will start this year MSc studies in genetics. One technician with basic education is also completing in 2011 his pre-university education. This department has mentioned the capacity need for training in Geographic Information Systems

2.2.3 Department of Assessment of Resources available to Artisanal Fisheries

The Department of Assessment of Resources available to Artisanal Fisheries has a total of 20 staff members. Nine staff members (45%) at the headquarters in Maputo and eleven staff members (55%) distributed through the provincial delegations of Fisheries

Research Institute. Six staff members (30%) hold MSc degree (equal proportion between male and female gender). This department have currently other eight staff members (40%) enrolled in MSc training (4 staff members are now carrying out their research for writing their dissertation, while another four staff members currently at the stage of course work (attending lectures). Training to MSc degree involves all technicians from the headquarters and provincial delegations. Four staff members of this department have secondary education concluded (pre-university).

2.3. CDS-ZONAS COSTEIRAS (CENTRE FOR SUSTAINABLE DEVELOPMENT OF COASTAL ZONES)

CDS-Zonas costeiras has among its staff, one member holding a MSc degree and six staff members with Licenciatura degrees (in the fields of Biology and Geography). Among these staff members with a Licenciatura degrees, two are currently carrying out their Master of Science studies in Environmental engineering and Geographic Information System Sciences. Three other staff members are expected to start their training to MSc degree in 2012 and 2013 in the fields of Aquatic Biology and Coastal Ecosystems (1), Geophysics, Environment and Territorial planning (1) and Climate Change (1). In 2014, two staff members are expected to start their PhD training in the fields of Climate Change for Coastal Zones (1) and Environmental Education in Coastal Zones.

Other 8 staff members have technical (pre-university education) training completed. All of them are currently enrolled to University training for Licenciatura degree courses at night to attain the degree of Licenciatura in the fields of Environmental management and Community Development Planning (4 staff members), Financial Management (1 staff member), Budget Planning (1 staff member)/ One staff member is currently taking technical training for Budget Planning and Patrimony.

2.4. CEPAM (CENTRE FOR MARINE AND COASTAL RESEARCH) – PEMBA-MICOA

CEPAM has currently three technicians with University degree in marine and coastal sciences and one CEPAM and 1 technician in aquaculture. CEPAM plans to recruit in 2011 more six technicians staff with University Degree (four in marine sciences and two for administration and finances).

2.5. SCHOOL OF MARINE AND COASTAL SCIENCES – QUELIMANE - EDUARDO MONDLANE UNIVERSITY

The school of marine and coastal sciences has its staff involved in MSc and PhD training through partnership programs and cooperation with several universities. At least 2 staff members are involved in PhD training in Physical Oceanography; The School also aims at training their staff members in the different research fields to PhD degrees. 3 staff members are currently involved in MSc training.

2.6. DEPARTMENT OF BIOLOGICAL SCIENCES

The Department of Biological Sciences of UEM is currently training 3 staff members to PhD degree in Marine and coastal Sciences. One staff member will start her PhD studies in the ecology of shrimps at their nursery grounds. The Department is also seeking to opportunities to involve those other (about 3 staff members with MSc degree) to continue their training to PhD degrees in Marine Ecology, Mariculture, Seagrass ecology.

2.7. INHACA MARINE BIOLOGICAL STATION – UNIVERSIDADE EDUARDO MONDLANE

The Inhaca island Marine Biological Station has currently two Researchers with University training. One MSc in Botany and 1 BSc (Licenciatura) degree in Physical Oceanography.

It has also 2 other technicians with high school education.

The EBMI plans to increase its research staff by recruiting 3 new researchers with licenciatura degree (BSc) and two technicians with high school education completed for

2.8. NATURAL HISTORY MUSEUM – UNIVERSIDADE EDUARDO MONDLANE

The Natural History Museum has 3 researchers, one holds a PhD degree in Zoology, one a MSc degree in Conservation Biology and one a Master of Arts in Museology. The Museum has also 8 technical staff members with completed high school education. One of the staff members has training as pedagogic technician and other with training in public administration.

The Museum has since 2010 until 2013 a post-doc fellow in Environmental Education from University of Aveiro.

The Museum plans to increase its research staff through internal training of their technicians to university degree. At the moment, 5 staff members of Museum are carrying out undergraduate studies at Eduardo Mondlane University and Pedagogic University in the fields of Veterinary, Terrestrial Biodiversity, Statistics, Education in Biology and Anthropology.

2.9. NATIONAL METEOROLOGICAL INSTITUTE

INAM has 19 basic technicians (12 technicians for transport, Communication and meteorology and seven are technical assistants).

Thirty two staff members have pre-university education of which 23 are professional technicians of Transport, Communication and Meteorology, 3 are Professional technicians of Public Administration and Four are technicians of Transport Communications and Meteorology

Three staff members hold a bachelor degree, two are Superior Technician in Public Administration and 1 in Information and Technology (ITC)

Thirty two staff members have BSc Hons (Licenciatura) degree. Of these 29 are Superior technicians for Transport, Communications and Meteorology N1, two are Superior Technicians for public administration and 1 in an Superior Inspector

There are seven staff members holding a Master of Science Degree and One with a PhD all in Meteorology and Climatology.

3. GRADUATE AND POSTGRADUATE TRAINING AVAILABLE IN MARINE SCIENCES AND OCEANOGRAPHY IN MOZAMBIQUE

3.1. Undergraduate training at ECMSC

The School of Marine and Coastal Sciences of Quelimane, UEM offers currently 3 undergraduate courses (each with 4 years duration):

- Licenciatura (BSc) in Oceanography,
- Licenciatura in Marine Biology
- Licenciatura in Marine Chemistry

Each course takes 25 students a year.

3.1.1. Structure and content of the Undergraduate courses at ESCMC

In the first semester, the students are taught basic courses in natural and social sciences with the aim to systematize, standardize and consolidate the basic knowledge of the recently recruited students for the professionalizing courses of the ESCMC. This approach has been chosen to overcome the differences in the level of training at different secondary (high schools) in Mozambique. The second semester of the first year has been conceived for initiation of students in the marine and coastal sciences, through teaching of several initiation courses in several fields of expertise in marine and coastal sciences, including the marine and coastal technology and engineering.

The second and third years of the course were conceived to provide the students with the solid and large knowledge base in the areas of course training.

In the last year of the course the students are training in doing, this means applying their knowledge of research and monitoring of oceanic processes, in the environmental management, marine and coastal resources, on the promotion of sustainable use and exploitation and management of sea and coast. Training activities include modules of application of knowledge, field trips, research projects, practices at institutions and dissertation for the culmination of their studies.

3.1.2. The Licenciatura course in Oceanography at ESCMC

The course provides most of its content to the Marine Sciences, starting with Introduction to Marine Sciences in the second semester, after the students have been taught 15 other basic- general- disciplines. The basic specific disciplines start in the third semesters (when students are taught Introductory courses of Physical, Chemical, Biological and Geological Oceanography and to the Coastal Engineering). The 4th Semester covers disciplines of Waves and Tides, Automatic measurement systems of Oceanographic data, Interaction between Atmosphere and Ocean, Applied mathematics to Oceanic Processes, Deep Sea Oceanography and Global Ocean Circulation, Turbulence and Mixing in Oceans. The 5th Semester provides training in Marine and Coastal Ecology, Sediment transportation, Oceanography of Estuaries and Lakes, Hydrodynamics, Marine Optics and Remote sensing. The 6th Semester has speciality disciplines in marine acoustics, climate and global climate change, management of watersheds and deltas, Hydrology and Waters Resources, Methods of Monitoring and Research in Oceanography, Hydrodynamics – high degree waves.

Modelling and simulation of Oceanographic Processes is taught in the 7th Semester, as well as marine pollution, extreme events in the sea and coast, maritime navigation and safety, mineral resources and hydrocarbons at sea and coast.

The 8th semesters provides training in Marine legislation, Institutional and Legal framework, Subaquatic Archaeology and Cultural heritage, Renewable energy of sea and coast, Marine and Coastal Management and the Dissertation.

3.1.3. The Licenciatura Course in Marine Biology at ESCMC

The 1st and 2nd semesters has basic introductory courses, of which the highlight are the Introduction to Marine Sciences and Earth Sciences. The 3rd Semester teach basic specific courses of Introduction to Physical, Chemical, Biological and Geological Oceanography and General Zoology. The highlights in the 4th semester are the disciplines of Waves and Tides, Physiology of Marine Organisms and Microbiology of marine Organisms. The 5th semesters includes basic specific courses of Marine and Coastal Ecology, Processes of Continental Shelf, Phycology, Marine Biological Resources, Marine Genetics, Behaviour of Marine Organisms and Programming. The 6th Semesters teaches Marine acoustics, climate and global climate change, marine biotechnology,

monitoring and research methods in marine biology, fishing gear – Selectivity and efficiency. In the 7th Semester the students are taught Modeling and simulation of Ocean Processes, Marine Pollution, Aquaculture, Exploration, Evaluation and Management of Fisheries, Catch processing and Quality Control. Then they carry out their field work. The eight Semester students are taught Marine legislation, Institutional and Legal framework, Sub aquatic Archaeology and Cultural heritage, Renewable energy of sea and coast, Marine and Coastal Management and finish their course.

3.1.4. The Licenciatura course in Marine Chemistry at ESCMC

This course also follows in the 1st and 2nd semester a similar list of basic courses of the Oceanography and Marine Biology. The 3rd Semesters also provides introductory courses in Physical, Chemical, Biological and Geological Oceanography, Analytical Chemistry and Chemical processes in the Ocean Interfaces.

The 4th Semesters provides training in Waves and Tides, Thermodynamics, Biochemistry, Biogeochemistry, Oil Science, Spectroscopy. The 5th Semester has disciplines of Marine and Coastal Ecology, Processes of the Continental Shelf, Organic matter in the marine environment, Hydrogeochemistry, Marine Ecotoxicology, Electrochemistry and Kinetics and Programming. The 6th semester Climate and Global Climate Change, Water Quality in Aquaculture, Chemistry of Estuaries and Mangrove swamps, Methods of Monitoring and Analyses in Marine Chemistry, . The 7th semester teaches modeling and simulation of oceanic processes, marine pollution, mineral resources and hydrocarbons of coast and sea, Fish processing and quality control and field work. The Eight Semester provides courses of Marine Legislation, Legal and Institutional Framework, Subaquatic Archaeology and Cultural Heritage, Marine and Coastal Management, Renewable energy of Sea and Coast and the Dissertation.

3.2. The Licenciatura Course in Marine, Coastal and Aquatic Biology at the Department of Biological Sciences, Faculty of Science

This course is designed to train people to work in the following type of institutions (job description): teaching institutions, water analysis labs, Environmental Affairs Departments, Fisheries Research Institute, Management Institutions for Wildlife Resources (Flora and Fauna); Environmental Consultants Companies, Business (Aquaculture), Museums; Management of marine, coastal and freshwater resources, Departments of management of marine resources, Environmental management and education, Private sector (ecotourism, diving centers), Bio-exploration and pharmaceutical industry and Food Processing from fishing.

In terms of profile, the undergraduate students of the course of marine, coastal and aquatic biology must know:

- concepts and theories of marine coastal and freshwater biology
- sampling techniques, identification and conservation of fauna and flora species of the marine, coastal and freshwater habitats

- the structure, function, biogeography and evolution of biological processes of coastal, marine, and freshwater habitats, their threats and conservation
- theoretical and practical principles of physiology of marine, coastal and aquatic organisms and their relationship with their habitats
- principles of integrated coastal zone management and watershed management (rivers, lakes and wetlands)
- Sampling and diagnostic methods relevant for the description and to monitoring of the status of habitats and phenomena (climate change, pollution, physical degradation) in the marine, coastal and freshwater habitats.
- Mapping methods of marine, coastal and freshwater habitats
- Institutional framework, policies and legislation applicable to fauna, flora and the habitats of marine, coastal and aquatic environments.
- Principles of planning, ordination and sustainable management of marine, coastal and aquatic habitats
- Basic principles of sustainable aquaculture in freshwater systems
- Principles and processes of environmental impact studies in the coastal zone and freshwater systems
- Computing systems of data collection, processing and analysis of fauna, flora and other resources on marine, coastal and aquatic habitats
- Communicate results of studies and reports to varied audiences

Abilities of graduates at the end of the course:

- Collect, preserve, identify, and classify specimens of fauna and flora of marine, coastal and aquatic environments.
- Apply concepts, principles and theories of marine, coastal and freshwater biology to real situations.
- Map and describe the marine, coastal and freshwater habitats.
- Monitoring of fauna and flora of marine, coastal and freshwater habitats.
- Carry out inventories of fauna, flora, and their habitats in marine, coastal and freshwaters areas.
- Evaluate and monitor the exploitation of biological resources in marine, coastal and freshwater habitats.
- Apply the scientific know-how in the building and management of aquaculture projects.
- Measure and determine the quality of marine, coastal and freshwater habitats, their flora and fauna.
- Collect, record, process, and analyze data about the marine, coastal and freshwater resources and habitats.
- Analyze the impact of exploitation activities of resources and of development in marine, coastal and aquatic environment.
- Environmental impact studies.
- Apply policies, laws and to know the institutional framework about the fauna, flora and habitats of marine, coastal and freshwater areas.
- Apply different techniques for restoration of marine, coastal and freshwater degraded habitats.

- Apply principles and methods of management of protected areas.

3.2.1. The structure and content of the Licenciatura Course of Marine, Coastal and Aquatic Biology

The undergraduate course (Licenciatura degree) has the duration of 3 years organized into 6 semesters. The first and second semesters provides students with basic general introductory disciplines of biology (zoology, botany), chemistry, mathematics and biostatistics, animal and plant physiology II and general ecology. In 3rd semesters (the second year) the students are taught disciplines of Plant and animal physiologies II, marine biology, introduction to oceanography, genetics and marine and freshwater flora. The 4th semesters teaches the disciplines of Aquatic Ecosystems, Biodiversity and coastal ecology, marine biology II, Population Biology and, Fundamentals of Aquaculture. The 5th semester of the course (3rd year) comprises the teaching of Introductory fishery biology and fishery resources; Diagnostics, degradation and restoration of habitats; Planning, ordination and legal and institutional Framework, Ecologic Anthropology and Project preparation. The 6th semester is reserved for the student to carry out his research project and writes a dissertation, but also are taught the discipline of Conservation and Management of Resources.

3.3 Professional and Graduate Education Institutions in Tourism in Mozambique

3.3.1 Professional Training in Tourism

Before 1995 the only training in Tourism was carried out by the Hotel Escola Andaluçia, which was a model training hotel to train professionals in hostelry. However, Since the creation of the Ministry of Tourism in 2000 (after separation from the Ministry of Trade and Industry), and the launching of Tourism Policy in Mozambique (in 2004) as a mass employing and transversal activity, a number of education institutions started training of people to the tourism industry.

Training in tourism has been recently introduced through several education high school professional training program (See PRETEP) and high education courses

In the Ministry of Education the National Directorate for Technical Professional Teaching (created by the Presidential Decree No. 18/2005 of 31 March) has a program called PRETEP

PRETEP is a unit within this Directorate which has the assistance of the Unit of Monitoring and Technical Assistance. PRETEP is a program that is carrying out reforms in the education sector in order to develop the technical professional education in the areas of Hostelry and Tourism, Agrohousbandry, Lab competences for lectures and Insertion of students with special education needs and rehabilitation and construction of infrastructures

The technical professional training in tourism in the National Education System started recently (since 2005) and the courses offered are Hotel Management, Receptionist, Bar and Table Operator. These courses are currently taught at the Commercial Institute of

Maputo and at the Professional School of Massinga at Inhambane. Curricula for these courses were developed based on the competence standards

Currently the Ministry of Education is training teachers to be distributed to the Commercial Institute of Maputo, Professional School of Massinga and Industrial and Commercial School of Pemba.

Teachers are being trained in teaching methods, and technical training. A group of teachers is being trained (the BSc degree) in Maputo by the Instituto Superior Dom Bosco, Based in Maputo) and six other teachers are trained under training at Professional School of Alternancia of Porto, In Portugal financed by a PIREP (Integrated Program of Reform of Professional Education) and by the Portugal Africa Foundation. PIREP wants to increase the number of teachers with a Bachelor degree in Tourism Administration in order to massify tourism professional training in Mozambique.

In the meantime, there are construction and repair of infrastructures to adapt them to the new teaching area and expansion of classrooms and libraries to accommodate the new professional tourism course. These activities have taken place in 2011-2012 at the Professional School of Massinga and Maputo Commercial Institute

In addition to infrastructure rehabilitation, there is a process of acquisition of lab equipment, computers, teaching material and books

3.3.2. High education Graduate courses in Tourism and Hospitality in Mozambique

In Mozambique three universities or high education institutes, namely Eduardo Mondlane University (UEM), Instituto Superior Dom Bosco and the Catholic University are providing courses for the tourism industry at the Provinces of Inhambane, Maputo City and Pemba City. These three provinces are known as the ones with the largest tourism potential in terms of resorts, attractive environments and visitors. The courses were all started in the 2000's. The Eduardo Mondlane University started in 2005, the ISDB started in 2007 and the Catholic University started its course on tourism in 2005.

A. Superior School of Hospitality and Tourism - ESHT – INHAMBANE

UEM has been training high level tourism technicians through the School of Hospitality and Tourism at Inhambane. This school was established in 2004, and takes about 90 students every year in three BSc honors (Licenciatura) courses; Hotel Management, Tourism Animation and

It uses leased infrastructures of the professional Training centre of the Mozambique Railway Company. Its establishment in this province was related with the fact that this province is the one with the great growth of tourism since 1993. The idea was to have a school at the centre of the tourism development in order to increase interactions between

tourist operators and students. The ESHT is also an adviser of the Provincial government on issues of the tourism planning and development

The training in tourism has been taking place at Eduardo Mondlane University since 2004 through the school of Hospitality and Tourism, which is located at Inhambane City, 480 km north of Maputo. Training takes place in working and post-laboral hours for Tourism, Hotel management and Business Management

The mission of the Superior School of Tourism and Hospitality is to **Missão**

- Train capable staff in the areas of Tourism and hospitality.
- Ensure the improvement of quality in Tourism and Hospitality services.
- Contribute for the design of tourism policies in the country

Objectives of the Licenciatura (BSc Hons) course on Tourism

Train personnel that may contribute to fulfil the main needs of tourism development,
Enable personnel to use specific technological instruments of the tourism sector,
Train personnel capable of design and implement the knowledge that integrate all the aspects of the tourism phenomena,
Prepare personnel to carry out professions at ambiances of multi-cultural human interaction

Conditions to enter the course

To get to these course the student must have completed the pre-university level or equivalent in areas which include obligatory mathematics

Conclusion of the technical course of Hospitality and Tourism

Pass an Admission exam in History and Geography

The Licenciatura course of tourism has two objectives:

- Tourism planning

- * Identification, characterization and diagnostics of specific problems and issues;
- * Conception of planning instruments, which can correct the existing asymmetries in tourism;
- * Implementation of planning instruments in the touristic field
- * Evaluation of results, monitoring of situations, adjustment of solving proposals.

In 2012 the ESHT conducted its 3rd graduation ceremony, graduating 63 BSc Hon's (Licenciados) in the course of Tourism. 12 graduated in orientation in Information and Tourist Recreation, a, 39 graduated in the orientation in Touristic Planning and 12 graduates in Hotel Management.

B. Instituto Superior Dom Bosco - ISDB – Maputo

This institution was built by the Salesian Community of the Catholic Church and was inaugurated in October 2007. It was built in Maputo and is training teachers. The Infrastructures constructed cost was 1 million American dollar Besides training of teachers (a distance education program) it also train n Bachelor graduates in Tourism Administration (a course lasting 3 years). This institute has an area of 5 ha , has 12 classrooms, 2 conference rooms and 2 libraries and has a residence for 50 intern students.

C. Faculty of Tourism Management and Computing at Pemba - Catholic University of Mozambique – Pemba

The Licenciatura (a four year course) course in Tourism and Hostelry Management is carried out under the law n.27/2009 of 29 of September on the high education, the statutes of the Catholic University of Mozambique and the regulation of the Faculty of Tourism Management and Informatics. The course intends to train qualified professionals to ach in the areas of Tourism and Hostelry, one of the industries with the largest growth in Mozambique and with great need of trained professionals

This faculty has a partnership with the Pemba Beach Hotel, a five star resort , and other partners, allowing the students unique opportunities for on the job training.

The course answers the needs of the modern curriculum ,that provide needed technical competences needed for tourism management, but also creates an forum for reflection about the type of tourism required and the better way in to answer the current challenges of development of this industry. For this the course inspired itself in the best curricula of international universities which are partners of Catholic University of Mozambique, but also incorporates reflections of the basic needs of Mozambique in this sector.

The graduate in Tourism and Hostelry Management is a professional with a wide qualification in the tourism sector, a sector under fast growth in the Mozambique economy, with several possibilities. Among the knowledge, abilities and attitudes are necessary to answer the different fields and institutions linked with tourism, such as events management, travel agencies, associated services including hotel management and restaurants (food and beverages).

The graduate in Toursim and Hostelry Management will have the following competences:

- Comunicate correctly in English and portuguese.
- Know the different theories about tourism and its management.
- Know the functioning of different departments in a hostelry institution (hotel, resoirt, etc).
- Know the different branches and services related with Tourism.
- Known the economic, social and cultural principles of Tourism and its management.

- Known the principles of strategic planning of activities for the tourism industry and the principles of marketing for the promotion of destinations and touristic activities.
- Know the principles of public relations , etiquette and protocol.
- Know how to apply the Information technology resources for the management of tourist institutions and financial accountancy of tourist enterprises.
- Known how to make tourist packages , working with all tourist sectors involved.
- Know how to identify and promote tourist destinations.
- Know how to organize and manage events, conferences , travel agencies and the various departments of hospitality institutions and restaurants.
- Know how to supervise and identify the training needs of the human resources in an tourist institution.
- Be sensitive to the challenges of sustainable development of tourism, respecting the environment and people.
- Be a responsible and accountable professional, according with the professional deontology and the reflexion of social ethic.

Professional areas of the Tourism training course at Catholic University – Pemba Delegation

The graduates in the course of Tourism and Hotel Management will be able to work in the public and private sector , as well as develop successful self owned business, such as:

- Animator of field work or ecotourism coordinator at protected areas
- Independent consultant for hospitality and tourism consulting companies
- Entrepreneurship, with self business, of private initiative
- Manager of Travel agencies and transports.
- Management of food stocks.
- Event and Congress manager.
- Manager of private companies of tourism development.
- Manager of public institutions of tourism and NGO's of the sector.
- Be a professional at the Departments of Public Relations and Marketing at several institutions.
- Be in charge of projects of community development through tourism.
- Supervisor or manager of hotels, resorts, marine cruise liners , hostels and restaurants, bars, caterings and all other ventures of the hotel industry and entertainment companies and cultural animation.

In order to graduate in the Licenciatura course of Tourism and Hospitality Management each student must approve (pass) all disciplines or modules of the curricular plan, completing a total of 180 academic credits.

3.3. POST GRADUATE TRAINING IN MARINE SCIENCES IN MOZAMBIQUE

3.3.1. Master of Science Courses offered at the Department of Biological Sciences, Eduardo Mondlane University

The Department of Biological Sciences is now running a third edition of the Master Course on Aquatic Biology and Coastal Ecosystems, which was started in 2008 and has recruited about 35 students.

This course is essentially designed to increase the research ability and skills of postgraduates who will be working at decision level positions in research and management institutions, enabling them to take sound, science based and knowledgeable options when addressing problems and issues in the field of aquatic ecology and coastal ecosystems and resource management and conservation. Therefore, the understanding of the structure and function of the ecosystems and of the research methods are important parts of all the gathering of knowledge for the candidates enrolling in this course.

Admission to this course is opened to all graduates in Biology, Physics, Oceanography, Tourism and other areas provided that they have fulfilled the conditions stated on the deliberation No. 3/CUN/UEM of the Regulation of Master Courses of Eduardo Mondlane University.

This Department also teaches since 2008 a Master of Science Course in Aquatic Biology and Coastal Ecosystem offering postgraduate training opportunities to Mozambican students in the country. The course is taught by 16 highly qualified national and foreign lecturers from Sweden, Portugal and South Africa (with PhD degree with experience in tropical ecosystems, mainly tropical eastern Africa) and includes a series of 8 mandatory modules:

- Research Methods in Ecology,
- Coastal Biodiversity and Conservation,
- Oceanography,
- Advanced Marine Ecology,
- Fishery Biology and Stock Assessment,
- Sustainable Aquaculture,
- Management of Freshwater Systems,
- Dune Ecology, Planning and Governance.

An emphasis is given to field practices and hands on experience during programmed field trips. The second year is dedicated to writing a dissertation.

The course consist of 120 European Credit Transfer System and the total study time including direct contact and independent study learning time during the course of 1500 hours. The first year is dedicated to compulsory modular courses and optional extra-curricular training.

From these students, three have successfully defended their thesis in the field of fisheries management and mangrove resource use (started at the end of 2010 and 2011). There are another nine students finishing that will hand their MSc dissertation and defend during 2011. The 11 students, who started last year, have already started their research work for dissertation. The research topics of most students so far include fisheries management, mangrove and sea grass ecology, heavy metals, invertebrate ecology and use, marine mammal's tourism, impact assessment of coastal development projects and coral reef ecology.

In addition of the normal training of the MSc course, the Masters students are exposed to extra-curricular courses such as open water diving courses and advanced GIS training.

3.3.2. Master of Science Courses offered at the Superior School of Marine and Coastal Sciences, Eduardo Mondlane University

The ESCMC offers the 3 Master of Science courses:

All courses have two years duration with a learning time of 1500 hours and account for 120 credits (European Credit Transfer System).

a) Master courses in Sustainable Aquaculture at ESCMC

The course aims at provision of advanced and applied training on culture of marine and freshwater species, emphasizing tropical species and environmental sustainability.

The course includes the analysis of environmental and ecological aspects of aquaculture, development capacity to design, build and manage units and production companies of extensive and intensive aquaculture and the environmental sustainability.

The course has 8 mandatory modules (research methods,) and 6 optional modules and the dissertation.

Name of the module or subject	Category	Semester
Techniques of Scientific research	Nuclear	I
Fishery Biology	Nuclear	I
Aquaculture, Socio-economics and business	Nuclear	I
Culture of marine species	Nuclear	I
Culture of estuarine and fresh water species	Nuclear	I
Fisheries Ecology	Optional	I
Marine Bio-safety	Optional	I
Interactions between Physical and Biological Processes	Optional	I
Aquaculture engineering	Nuclear	II
Pathologies in Aquaculture	Nuclear	II
Aquaculture and Environment	Nuclear	II
Management and administration of Aquaculture companies	Optional	II
Fish processing technology	Optional	II
Integrated management of Coastal Zones	Optional	II
Dissertation Project	Nuclear	III e IV

b) Master course in Marine Biology and Fisheries Management at ESCMC,

The course intends to provide advanced training on fisheries, their relationship with ecosystems and environment. Emphasis is provided to coastal and estuarine fisheries. The course also provides knowledge about fishing technology and fish processing technology and aspects of fisheries economics and sustainability.

The course includes disciplines of prospecting, evaluation and management of fisheries, conservation and protection of ecosystems, management of marine protected areas; catch, processing and control of fish quality; viability of fisheries and aquaculture initiatives; environmental impact initiatives of fisheries and aquaculture.

Name of modules or subject	Category	Semester
Techniques of Scientific Research	Nuclear	I
Fisheries Oceanography	Nuclear	I
Fisheries Biology	Nuclear	I
Fisheries Ecology	Nuclear	I
Chemical Oceanography	Optional	I
Marine bio-safety	Optional	I
Interactions between physical and biological processes	Optional	I
Stock evaluation	Nuclear	II
Fisheries economics	Nuclear	II
Fisheries management	Nuclear	II
Fisheries Technology	Optional	II
Fish processing Technology	Optional	II
Aquaculture Engineering	Optional	II
Aquaculture and Environment	Optional	II
Integrated Management of Coastal Zones	Optional	II
Remote Detection and GIS	Optional	II
Dissertation Project	Nuclear	III e IV

c) **Master Course in Oceanography at ESCMC**

The course intends to provide the advanced training and application of oceanography in the observation, monitoring and forecasting of oceanographic processes and of marine and coastal weather. It provide the students with capabilities to develop and apply diagnostic and predictive numerical models about oceanic processes

Title	Category	Semester
Techniques of Scientific Research	Nuclear	I
Introduction to Applied Oceanography	Nuclear	I

Dynamic Oceanography	Nuclear	I
Measurement and analysis of Oceanographic data	Nuclear	I
Fisheries Oceanography	Optional	I
Chemical Oceanography	Optional	I
Interaction between Physical and Biological Processes	Optional	I
Operational Oceanography	Nuclear	II
Remote detection and GIS	Nuclear	II
Oceanic modeling	Nuclear	II
Marine technology and Energy	Optional	II
Integrated Management of Coastal zones	Optional	II
Aquaculture Engineering	Optional	II
Dissertation Research Project	Nuclear	III e IV

4. CURRENT OR ON GOING TRAINING OF STAFF AT RESEARCH AND TEACHING INSTITUTIONS

4.1. INAHINA

Department of Navigations in the section of Currents and Tides (Oceanography), have has 9 staff, 1 PhD. Currently there is one staff under training for a PhD in Oceanography.

The Department of Hidrography has six hydrography technicians with University education and 3 hydrographic technicians (technical training). They also have one technician in the field of cartography. Two staff members of the Department of Hydrography are under training for a Master degree in Oceanography and Geographic Information Systems (GIS). This department is also carrying out internal training of their technicians in topography

4.2 IIP – FISHERIES RESEARCH INSTITUTE

The Department of Aquatic Environment of IIP has seven technical staff (five are at headquarters in Maputo) and two at the IIP delegations (Sofala and Zambezia), one has PhD degree, two staff members have MSc degree and the remaining four staff members have licenciatura (BSc) degree.

In terms of areas of training of the staff 3 are biologists (one PhD, one MSc), one is geographer and 4 oceanographers, (of these two were trained at Department of Physics, UEM and other two were trained at the School of Marine Sciences of Quelimane.

The perspective of this department is to expand and be represented by one technician per province. Currently staff of this Department of IIP is engaged in MSc training in Marine Biology (two staff members) and in PhD training (two staff members).

The Department of Assessment of Resources available to Artisanal fisheries has 8 staff members (40%) enrolled in training for MSc degree, most at Eduardo Mondlane University. Four of these staff are carrying out research for writing of dissertations and another four staff have enrolled to MSc training this year (2011) and are attending training modules (1st year of the MSc training at UEM). Training involves staff based the headquarters and the provincial delegation of IIP.

4.3. ESCMC – EDUARDO MONDLANE UNIVERSITY

The Superior School of Marine and Coastal Sciences of Quelimane has a teaching staff of 12 lecturers all Mozambicans, two with PhD degree in Oceanography, 10 with Master degree in Oceanography, Aquaculture, Marine Biology, and Chemistry. The School has also 19 technicians.

At least two staff members are involved in PhD training in Physical Oceanography; The School also aims at training their staff members in the different research fields to PhD degrees. Three staff members are currently involved in MSc training

4.4. DEPARTMENT OF BIOLOGICAL SCIENCES – EDUARDO MONDLANE UNIVERSITY

Currently (2011- 2015) there are 3 staff finishing their training in marine and coastal sciences under this program and 1 new staff starting her PhD training. This phase also aims at formation of research groups of UEM.

The Department of Biological Sciences has been also involved in forming research consortiums to apply for international funds for research 9 (2-4 funding research proposals a year). In addition senior staff of the Department of Biological Sciences have been involved in 4 programs of Marine Science for Management in the dealing with climate change (Mangroves and climate change, sea grass and climate change, coral reefs and climate change and shared fisheries stock and climate change) for the period 2010-2013 funded by WIOMSA.

4.5. NATURAL HISTORY MUSEUM – EDUARDO MONDLANE UNIVERSITY

The Natural History Museum has 3 senior researchers: one hold a PhD degree in Zoology (marine mammals) and 1 have a MSc degree in Conservation Biology. And another researcher holds a Master of Arts in Museology. Currently, one of the staff is carrying out PhD training in Zoology.

Five technical staff are currently involved in training for university degree. Two staff members are carrying out Licenciatura courses in Biology, and Education of Biology; one is carrying out Licenciatura training in Veterinary, One is completing the licenciatura degree in Statistics and one is carrying out her Licenciatura in Anthropology.

4.6. National Meteorological Institute -INAM

INAM does not provide any information about current training which is taking place, despite the fact that it has a department of professional training which carries out specific capacity building for its staff and monitor the progress training of its staff at other institutions.

5. TRAINING NEEDS AT RESEARCH AND TECHNICAL INSTITUTIONS

5.1. INAHINA - Department of Hydrography and Department of Navigation

Train at least two staff in instrumentation in order to handle oceanographic equipment (CTD and RDCP).

Training for a PhD degree of 1 staff in Physical Oceanography (preferably distance training)

Train of a basic technician in instrumentation

The Department of Navigation would like on -site training in cartography for technicians, and training on methods of collection bathymetric data and training on management of bathymetric data.

5.2. Fisheries Research Institute

The Fisheries Research Institute in its strategy identified a number of technical scientific weaknesses:

- lack of focus on fishery research activities;
- lack of integration of fishery research (with socio-economic and bio-economic research);
- Lack of a holistic ecological approach in the evaluation of fishery resources;
- Weak capacity in fish technology;
- Weak capacity in bio-economics;
- Lack of integrated databases;
- Insufficient capacity in statistical analysis;
- Lack of annual evaluation of exploited resources in the artisanal fisheries;
- Inadequate capacity in genetics and taxonomy;
- Insufficient capacity to research new fishery resources, coastal habitats, vulnerable species, marine protected areas, modeling and GIS;
- Low research capacity in Aquaculture;

The Department of Oceanography and Aquatic Environment has identified the following needs:

Training in planning of research cruises, management of research operations during research cruises, information management generated during cruises and monitoring activities; accessing of information and samples collected during research cruises.

Need to train lab assistances on handling oceanographic instruments (CTD, Current meters, Rosettes, tide gauges).

In addition to the identified needs, the Department of Assessment of Resources available to artisanal fisheries has identified the following training needs:

Short courses:

- Scientific writing
- Preparation of project proposals
- Ecosystem based approach
- Preparation of management plans
- Taxonomy

Formal training

Post graduate training (PhD) in management of natural resources

Specific training for performance at work

1. Conception of research methodologies for

- Assessment of existing stocks of exploited resources
- Exploration of resources and emerging fisheries;

2. Análise da informação

- Statistical treatment of data and estimation of sampling errors
- Quantitative evaluation of exploitation level of resources (application of mathematical models for evaluation of fishery resources)

5.3. CDS Zonas Costeiras – MICOA

CDS has identified the following training needs for short term capacity building:

Advanced English

Environmental education

Advanced and Environmental statistics

Documentation and Information Management (databases)

Journalism

Monitoring and Evaluation Information Systems

Land Use Planning and Ordination

Remote sensing and modeling of floods

Strategic Environmental Impact Assessment

Geoprocessing and statistical data analysis

Human resource management

Administration and management of Public Accounts

Medium and long term training needs (to be started in 2012 -2014) includes 1 PhD training in Climate Change, 1. PhD training in Environmental Education, 1 MSc training in Climate Change, 1 MSc training in Geophysics, Environment and Territorial Planning and 1 MSc training in Aquatic Biology and Coastal Ecosystems

5.4. CEPAM _ MICOA

Training needs of CEPAM would be to train their staff to Master of Science and PhD Degree in Marine Science

Short terms courses in scientific methods in marine ecology, aquaculture, oceanography, coral reefs, sea turtle ecology and monitoring, marine mammals research and scientific diving.

5.5. UEM- ESCMC

a) Equipment needs

The school needs capacity in terms of instruments – tide gauges, current meters, devices for generation of tides and current energy and transform into electric power, acoustic instruments (sensors) for marine measurements. Communication systems and an internet and computer pool to increase the data storage capacity

b) Training needs

Instrumentation and use of data gathering instruments on marine environment

Methods of satellite data analysis of oceanographic data

Training in storage and handling and processing of massive oceanographic data

Training in sediment analysis (marine chemistry and marine geology)

Training in the teaching and learning capacity for small scale aquaculture and Mari culture

Participation and training of Master students in Oceanographic cruises

5.6. UEM-Department of Biological Sciences

a) Short term capacity building (training needs)

Methods of collection of oceanographic data, data analysis and data storage

Geographic Information Systems and remote sensing techniques

Taxonomy of fish larvae and invertebrates

Introduction to modeling of oceanographic and biological data

Training of Master students during oceanographic and biological research cruises

Design interdisciplinary marine research

b) Formal training to MSc and PhD degree in Marine Biology and Biological Oceanography

The Department of Biological Sciences intends to train another 4 staff members in marine biology to PhD level in the fields of mangrove ecology, marine biology, seagrass ecology and human ecology. It would like to train staff members in the field of genetics

5.7 UEM- Inhaca Island Marine Biological Station

Training needs (short courses) include scientific diving, sampling methods, data collection and analysis and writing of scientific reports

Design and management of research projects;

Geographic Information Systems and remote sensing techniques;

Statistical models;

Scientific Illustration of marine organisms

5.8. UEM- Museu de História Natural

Training in systematics and taxonomic methods of marine biodiversity
Curation of marine species
Electronic data management and
Techniques for Environmental education and awareness for the marine environment
Collection and management of genetic samples
Training in genetic analysis
Techniques of environmental awareness of the marine sciences
Scientific Illustration of marine organisms
Training in modern taxidermy methods

5.9. National Meteorology Institute (INAM)

INAM need are the training of staff members to the level of licenciatura degree in the fields of Meteorology and Oceanography. Also postgraduate training in the fields of Marine Meteorology, Oceanography, Climate and Environment, Remote Sensing and Geographical Information Systems.

Table 2. List of training needs requested by the Institutions

Institution	Department	Training needs	
		Short courses	Long term training
INAHINA	Hydrography: Oceanography, Currents & Tides	Train at least two staff in instrumentation to handle the CTD and RDCP	1 PhD in Oceanography
INAHINA	Department of Navigation	Training in Cartography	
IIP – Fisheries Research Institute		Scientific writing Preparation of research proposals Ecosystem based Approach for fisheries management Planning and management of research cruises, management of research activities during research cruises Methods of Marine and Fresh Water chemical analysis Instrumentation and handling of CTD, Rosettes, Current meters and tide gauges Geographic Information Systems Elaboration of Management Plans	Taxonomy and Genetics, Statistical analysis and Modeling Research in MPA, Vulnerable species PhD in Natural Resource Management
MICOA	CEPAM (Centre for Coastal and Marine Research)	Scientific methods on oceanography, marine ecology, aquaculture, oceanography, coral reefs, Sea turtle ecology and monitoring, Marine mammals research, Scientific diving Curation of marine species and biological collection management taxonomy and systematics of marine species Scientific Illustration	MSc and PhD training in Oceanography, Marine Biology
MICOA	CDS-Zonas	English (1) and Advanced English (3),	PhD in Climate Change (1)

	Costeiras	Environmental Education (1), Communication and Marketing (1); Advanced statistics and environmental statistics (1); Information Management and Documentation (1), Journalism (1), Remote Sensing and flood modeling (2); Strategic Environmental Impact Assessment (3); Geoprocessing and Statistical data analysis (1); Territorial Planning and Ordination (1) Human resources management (1) , Administration and Public Accounts (3)	PhD in Environmental Education (1) MSc in Climate Change (1) MSc in Geophysics (1), Environment and Territorial Planning (1)
Eduardo Mondlane University – Faculty of Science	Inhaca Marine Biological Station – EBMI	Scientific diving; Sampling methods, collection and data analysis; Writing of Scientific reports. Design and management of research projects; GIS e remote sensing; Statistical modeling;	MSc and PhD training of staff in the field of Marine Biology
Universidade Eduardo Mondlane – Faculty of Science	Department of Biological Sciences	Methods of Biological Oceanography, Fish larvae and invertebrate taxonomy, Participation in oceanographic surveys, Use of GIS and remote sensing methods, Collection, access and use of oceanographic data	MSc in Genetics of Marine organisms and PhD in Marine Ecology (including mangrove ecology, seagrass ecology ad mariculture of invertebrates),
Eduardo	ESCMC – School	Instrumentation and use of data gathering instruments on	

Mondlane University	of Marine and Coastal Sciences	<p>marine environment</p> <p>Methods of satellite data analysis of oceanographic data</p> <p>Storage, handling and processing of mass oceanographic data</p> <p>Sediment analysis (marine chemistry and marine geology)</p> <p>Teaching and learning capacity for small scale aquaculture and Mariculture</p> <p>Attendance of staff and Masters Students in Marine/Oceanographic Research cruises</p>	
Universidade Eduardo Mondlane	Natural History Museum	<p>Training in systematics and taxonomic methods of marine biodiversity</p> <p>Curation techniques for marine species</p> <p>Electronic data base management</p> <p>Techniques for Environmental education and awareness for the marine environment</p> <p>Collection and management and curation of genetic samples</p> <p>Training in genetic analysis</p> <p>Scientific Illustration of Marine organisms</p> <p>Training in modern taxidermy methods</p>	Msc in Environmental Education
National Meteorology Institute (INAM)		Short courses in Marine Meteorology, Oceanography, Climate and Environment, Remote Sensing GIS	BSc and MSc in Marine Meteorology, Oceanography, Climate and Environment, Remote Sensing GIS
Ministry of Education _ Professional Training Schools	National Director for Technical Professional Education	<p>Training of teachers in Tourism at Bachelor degree</p> <p>Short courses for Directors Professional training in Tour</p>	
Eduardo Mondlane University	Superior School of Hostelry and Tourism		MSc and PhD training in tourism planning and development

Catholic University of Mozambique	Faculty of Tourism and Informatics		MSc and PhD training in tourism planning and development
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5.7. Currents training and capacity building needs in the tourism education sector

The training in tourism sector in Mozambique is very recent and restricted to few locations of the country, while the tourism potential is high throughout the country. Both professional and high education training started in 2005, following the approval of the tourism industry which recognizes the potential socio-economic importance of sector Mozambique. In the course of this study it was not possible to obtain the specific capacity building and training needs. However, training of teachers for teaching in professional education is identified by the Ministry of Education as a priority; while for higher education institutions the capacity building needs required include training of their staff to post graduate levels (MSc and PhD) and the development of Postgraduate courses on Tourism

6. Institutions and people contacted during the survey

Name	Position	Institution
Mrs. Candida Sete	Head of Department of Aquatic Oceanography	Instituto Nacional de Hidrografia e Navegação
Mr. Hermes Pacule	Director	Centro de Pesquisa Marinha e Costeira de Pemba
Mrs. Lisette Palha de Sousa	Head of Department of Resources Accessible to Industrial Fishery	Instituto Nacional de Investigação Pesqueira
Mr. Emídio André	Head of Department of Oceanography and Aquatic Resources	Instituto Nacional de Investigação Pesqueira
Mrs. Isabel Chauca	Head of Department of Resources Available to Artisanal Fisheries	Instituto Nacional de Investição Pesqueira
Mr. Gabriel Albano	Head of Department	Inhaca Marine Biological Station
Mr. Fernando Saide	Deputy Director	Escola Superior de Ciências Marinhas e Costeiras de Quelimane
Mr. Carlos Bento	Researcher	Museu de História Natural
Mr. Manuel Poio	Director	Centro de Desenvolvimento Sustentável para as Zonas Costeiras
Mr. Henriques Balidy	Technician	Centro de Desenvolvimento Sustentável para as Zonas Costeiras

7. BIBLIOGRAPHY:

Canhanga, S.J.V and Nehama, F. P.J.(2006) **The Mozambican national sea level report.**

CEPAM (2010) Plano de Desenvolvimento Institucional – CEPAM. Draft Version

Conselho de Ministros (1998).Criação e Estatuto Organico do Instituto Nacional de Hidrografia e Navegação. Segundo Suplemento. Decree No. 40/89.. 5 December 1989. Boletim da República No. 48. Serie I

Conselho de Ministros (1998). Criação do Instituto de Investigação Pesqueira. Decree No. 63/98. 24 November 1998. Boletim da República No. 46. Serie I.

Conselho de Ministros(2007). Criação e Estatuto Orgânico do Centro de Pesquisa Marinha e Costeira Decree No. 16/2007 of 16 April. Boletim da República No .14. I Serie

Conselho de Ministros (2003). Criação e Estatuto Organico do Centro de Desenvolvimento Sustentavel para Zonas Costeiras. Decreto 5/2003 de 18 de Fevereiro. Boletim da República No. 7 , I Serie.

Department of Biological Sciences (2007) Course Curriculum of a Master Course in Aquatic Ecology and Coastal Ecosystems, Eduardo Mondlane University

IIP (2008) ABORDAGEM ESTRATÉGICA DA INVESTIGAÇÃO PESQUEIRA PARA O PERÍODO 2008 – 2012.

<http://www.inam.gov.mz/> Instituto Nacional de Meteorologia

http://www.ucm.ac.mz/cms/licenciaturas/gestao_turismo

<http://familiasalesianamaz.blogspot.com/2010/11/instituto-superior-dom-bosco-formacao.html>

<http://www.flcs.uem.mz>

<http://www.mitur.gov.mz/Ministerio> do Turismo

<http://www.visitmozambique.net/>

<http://www.uem.mz/> escmc