

**Agulhas and Somali Currents Large Marine  
Ecosystems Project**

**Capacity Building and Training Component**

**National Training Plan for Madagascar**

## 1. INTRODUCTION

### 1.1. SOME GLOBAL DATA FOR MADAGASCAR

Madagascar, located between 11°57'- 25°31'S and 43°14'- 50°27'E in the Indian Ocean, enjoys a location and a tropical climate favorable to the development of biological resources, both terrestrial that coastal and marine areas.

Spanning a length of 1,600 km from north to south and a maximum width of 600km, this large island has an area of 587,000km<sup>2</sup> and a length of coastline estimated at more than 4,500km. The continental shelf is rarely more than 60m depth, where the extreme south (Taolagnaro) where a maximum depth of 130m has been detected. It contains varied habitats including mangroves, lagoons, estuaries, rocky outcrops, pebbles and sand. It is bordered at the barrier reef slope by submerged and scattered within the area of coral reefs with trawling muddy or sandy-muddy bays located in a high sedimentation rate.

Beyond its internal waters, Madagascar has an EEZ of an area of 1,140,000km<sup>2</sup>. These varied habitats allow a wide variety of coastal and marine species to grow and are subject to operating across traditional, artisanal or industrial.

### 1.2. SEAFARER SECTOR EVOLUTION MADAGASCAR

Although Madagascar is the 4<sup>th</sup> largest island in the world, sea-related activities (production, conservation, research activities) are much less significant compared with those of the terrestrial environment.

From an institutional perspective, the marine sector has been neglected all the time compared to other sectors (agriculture, livestock, forest, others ...). In the sea fisheries in Madagascar, since 1957, the power to manage this sector was for the Fisheries Division of Livestock Service, which under the Ministry of Agricultural Production and Agrarian Reform (MPARA). This Division was responsible for marine fisheries and artisanal fisheries and was managed by several managers from the breeding Department. The financial and human resources at that time were inadequate. Following the establishment of the Department of Animal Production and Forestry (MPAEF) in July 1983, a Department of Marine Fisheries attached to this department was created whereas the Department of Inland Fisheries and Aquaculture remained attached to the Department of Waters and Forests. The link between maritime and continental fishing then remains almost nonexistent.

Following the restructuring of MPAEF by decree 85/127 in 1987, a new organization was established in which the Marine Fisheries Service and one of the Inland Fisheries and Aquaculture were fused in a same direction called Direction of Fisheries and Aquaculture (DPA). This direction evolves according to time, and becoming now a Direction of Fisheries Resources (DRH) which is attached to the Ministry of Agriculture and Fisheries.

It is only in November 1991 that was created a Department of Sea and Fisheries Resources, but that lasted only five weeks. The Direction of Fisheries and Aquaculture found then Ministry

of Agriculture and Rural Development (December 1991-August 1995), to become a separate department (Department of Fisheries and Fishery Resources) in 2.5 months, and then rejoin the family of Agriculture until May 1996. From June 1996 to 2002, we witnessed the resurrection of the Ministry of Fishing and Fishery Resources, which was subsequently reinstated in the Ministry of Agriculture until now.

The creation of the DPA in 1985 and the development of fisheries assume the existence of qualified and specialized in different economic sectors or management of the environment such as fishing groups, fishing companies, development projects. Training needs in fisheries are considerable at this time and are at all levels (Andrianaivojaona and Kasprzyk, 2003; Andrianaivojaona et al, 2004). Furthermore, there was a deficiency in terms of training centers for people to work in the field of fisheries and aquaculture. At Higher Education, only the High School for Agronomic Sciences (ESSA) of the Antananarivo University are the only institution training personnel specializing in the field of agriculture, fisheries and the component affects only one tenth of curriculum.

Regarding conservation activities in Madagascar, the efforts so far in protected areas, are especially focused on the land part. Before 2004, only 2 of the 44 national parks are created in the marine environment. This marine park covers an area of Mananara 1,000 hectares, created in 1989 by Decree N° 89/216 of 07/25/1989, and the Masoala, an area of 1,000 hectares was established ten years later, that is to say in 1997. It was not until 2003 that it is committed to the vision Durban, tripling the protected area of 1.7 million hectares in 2004 to 6,000,000 hectares in 2012. In this context, Nosy Mangabe (block 250 hectares) and the National Park Sahamalaza (26,035 hectares) with 2 marine plots were enacted in 2005 and 2007 respectively. In addition to these four marine parks, other marine areas are already designed to be protected with the implementation process is underway, either by the governing body which is the former MNP ANGAP (eg Nosy Hara, Nosy Ve, Kirindy Mite), or by other conservation organizations associated with other NGOs or research institutions (WWF, Blue Venture Reef Doctor, IHSM, etc ...). or by various national or international institutions (MNP, WWF, WCS, CI, NGOs Blue Venture, NGOs Reef Doctor, Project PACP).

## 2. INVENTORY OF ACTIVITIES FOR DEVELOPMENT OF EXISTING BUILDING TO MADAGASCAR

### 2.1. BUILDING, FINANCING AND GENERAL INFRASTRUCTURE

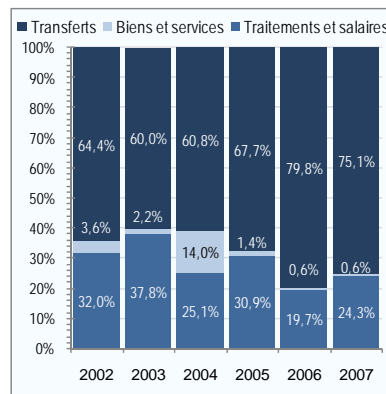
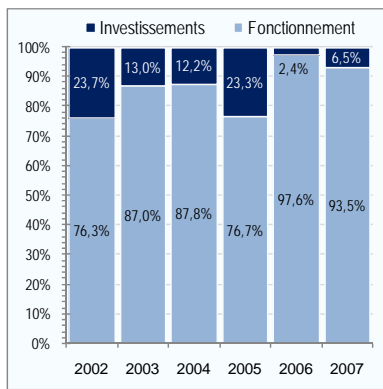
From the period 2003, the Malagasy State has spent an average 15.5% of public expenditure in the education sector (primary, secondary, technical and vocational education, higher education and scientific research), which received 21.5% of current expenditure of the state and 9.1% of its capital expenditure. In 2007, the shares of the budget accounted for 22.4% and 12.0%, or 17.6% of the overall state budget.

For example, the art public spending on education has averaged 3.4% of GDP during the period 2003-2006. Since 2003, public expenditure on education as a share of GDP has steadily increased from 3% in 2003 to 3.8% in 2005. During 2006, this share dropped to 3.3%.

If the effort of public education funding in Madagascar are doing compared to the average observed in several other countries in terms of the proportion affected in the state budget, but expressed as a proportion of GDP, it lags behind by compared to several countries in the region or the same level of development. The low level of fiscal pressure, which explains this phenomenon, however, shows a lack of resources for financing education in a context marked by an almost exclusively public funding of education spending.

Public expenditure in the field of higher education in 2007 exceeded 55 billions Ar (or U.S. \$ 27.5 million) representing 11.3% of the education budget, about 1.9% of state budget and 0.4% of GDP. An international comparison shows that Madagascar is among the countries spending a low share of their resources to higher education as a proportion of GDP. The composition of the budget for higher education in recent years has been characterized on the one hand, the decreasing costs of investment and, secondly, the balance of transfers in current expenditure. The following figure illustrates the structure of the budget for higher education during the period 2002-2007.

Figure 1: Structures of Higher Education Budget



1a: Structure of the budget for higher education  
Source: Based on data MENRS and MFB

1b: Structure of the operating budget for higher education  
Source: Based on data MENRS and MFB

The management of overtime at the six public universities is a problem that must be mastered. Indeed, the permanent teacher provides on average nearly 400 hours in the form of overtime, maybe nearly four times what it that it swift in obligation of service whereas some teachers do not achieve the totality of the "obligation of service" or the hourly load regulation which is set at 125 hours per year. The observed average is around 100 hours per year, that is to say a rate of 80% completion.

The absence of an adequate system of computerization on the level of the universities strongly handicaps the system of governance already slightly powerful.

Moreover, it is clear with funding depends heavily on state subsidies, the texts governing the organization and functioning of universities are obsolete and leave little leeway for them they can improve their own revenue .

## 2.2. EVALUATION OF TRAINING ACTIVITIES

### 2.2.1. Universities: description of training institutions

#### 2.2.1.1. Background

Higher education in Madagascar is divided into six universities in the six former provinces in which the faculties, schools and institutes provide training geared to different disciplines. He has been confronted with various problems for several years. The analysis on the results of the various studies and discussions held until now made it possible to release its most projecting weaknesses which are focused more particularly around the access, the quality, the internal and external effectiveness, the relevance, the gouvernance, the mode of financing, the monitoring and evaluation as well as adaptive problems involved in the change of behavior and mentality. Given these findings, the Ministry of Higher Education and Research Scientist or MENRS is forced to undertake a reform of higher education.

#### At the level of access

In spite of the progress realized over past decade, in particular through the insertion of the modules related to the problems relating to the marine and coastal environment in particular, access to specific training in marine science and corollaries is generally limited. Although Madagascar is the fourth largest island in the world, and thus favors marine resources (living and non), training in marine science and fisheries are largely insufficient and is performed by a single institution, IH.SM University of Toliara.

The insufficiency of the diversification of the formations opened from a distance and the low capacity of reception of the private higher institutions (6-7%) only exarcerbates the problem of the new graduates to continue their studies.

#### In terms of quality and relevance

The long stream of public universities have a very low efficiency particularly at the transition from first year to second year. The loss in the first academic year is not a new phenomenon, nor specific to certain business or universities. Indeed, examination of available data shows the persistence of this phenomenon for several years despite the measures applied to selections for access in 1st year, and is observed in different universities. The table below illustrates these remarks.

Table 1: Success rate of surrender to end the first year of university study  
Source: MENRS, 2008

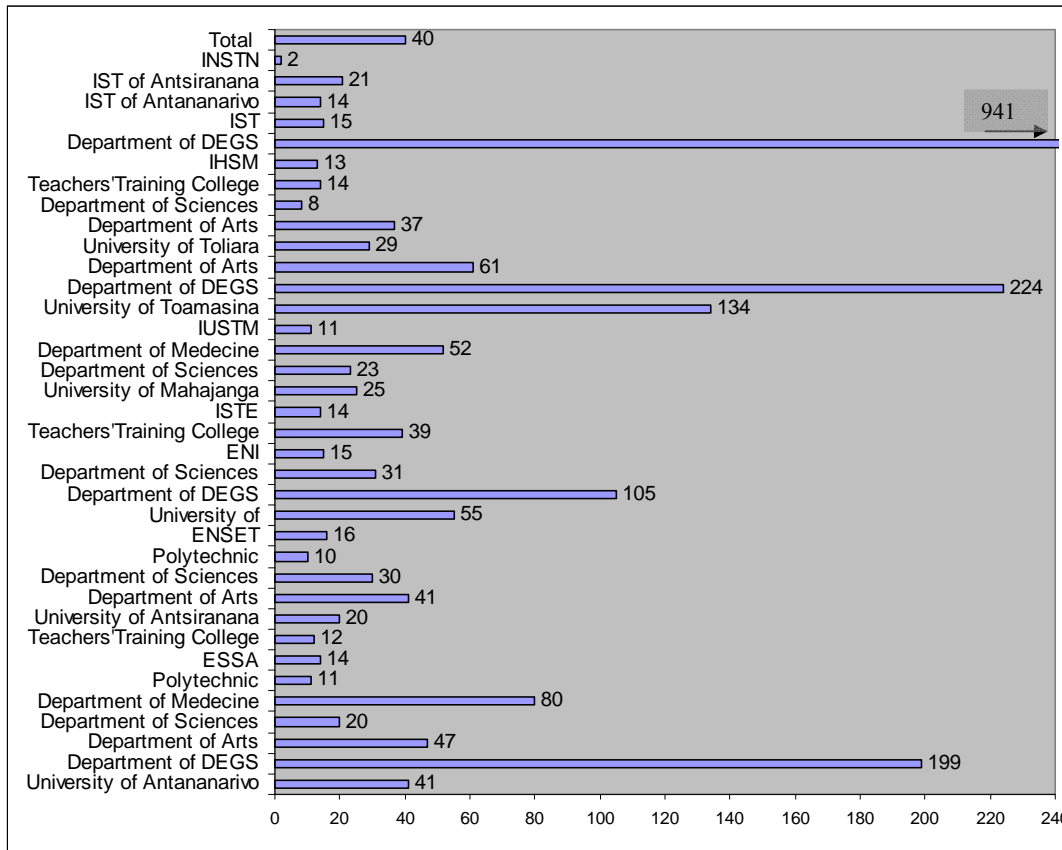
	Success Rate	Abandonment Rate	Success Rate	Abandonment Rate	Success Rate	Abandonment Rate
Year	2001-2002	2001-2002	2003-2004	2003-2004	2006-2007	2006-2007
Antananarivo	42.5%	40.0%	43.7%	34.4%	42.4%	43.8%
Antsiranana	45.8%	34.4%	21.8%	70.3%	53.6%	35.3%
Fianarantsoa	38.9%	36.7%	10.0%	67.9%	44.7%	27.6%
Mahajanga	38.9%	36.7%	30.7%	55.0%	38.1%	50.9%
Toamasina	48.8%	33.7%	13.1%	79.9%	68.0%	18.5%
Toliara	55.2%	30.6%	58.8%	22.6%	58.4%	30.0%
Average	43.2%	38.4%	36.7%	43,9%	46.9%	38.5%

The issue of effectiveness of higher education seems to be explained by two phenomena: an enormous phenomenon and a phenomenon of ways. Generally, the success rate decreases with increasing the size of establishments/field of study: over 500 students per field of study, the chances of achieving high performance in terms of internal efficiency are reduced seriously. The search for possible relationships between performances and means shows how that efficiency is not only a question of means: the dimensioning of the establishments, the choice of the field study, the justified orientation of the students, the qualification, the training and the motivation of the teaching personnel and the existence of a favorable extra-curricular environment are as many factors supporting a better effectiveness of the higher education.

Figure 2 shows the imbalance in the distribution of ratios by institution as reflected in the statistics of the academic year 2006-2007.

Figure 2: Ratio by setting

(Source: MENRS, 2008)

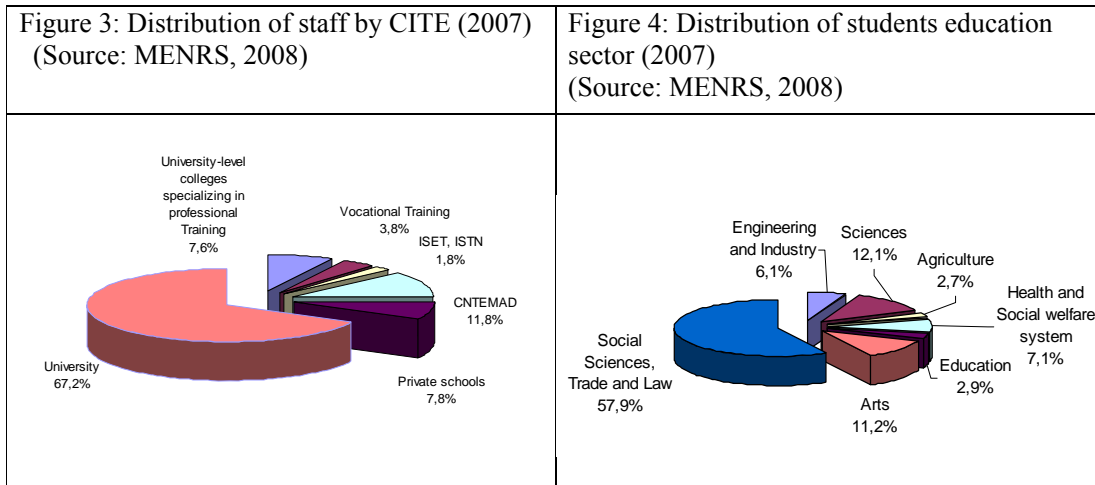


The development of curricula within the autonomy of the university with the only internal validation by the Scientific Council in the absence of any structure of external evaluation, does not promote the improvement, or the updating or the adequacy training/employment.

With the problem of obsolescence of equipment and teaching materials and laboratory still comes to be added the absence of an adequate policy of their modernization and their maintenance.

Higher education in Madagascar remains a public school prevailed by academic training with more than 92% of students enrolled in the public sector with less than 15% are pursuing a technical or type schools. The weight of the private sector (approved) remains below 8%. The graphics 2 and 3 give the structure of the distribution of students by education sector in 2007. The distribution of students by area of specialty by the International Standard Classification of Education (CITE) of UNESCO, shows the predominance of sectors of Humanities (Letters) and

Social Science serving nearly 70% of students. The place of the technical field remains limited : the influence of industrial and engineering sectors is 6% (Figures 3 and 4).



Concerning the relative formation on marine science and marine and coastal environment, the Halieutic Institute and Marine Sciences (IH.SM) at the University of Toliara is the only higher education institution specializing in this field. Some departments of other universities provide some modules related to fishing or to the environment that we will describe there'after in our report.

#### 2.2.1.2. The Halieutic Institute and Marine Sciences (IH.SM)

The IH.SM was created in 1992 (Ministerial Decree No. 92/1026 of 09/12/1992) following the merger of three entities: the Marine Station, the applied ocean science and Higher Education Unit fisheries. He has for mission the formation and the research out of matters of oceanography, fishing and aquaculture, and marine and coastal environment.

The IH.SM is in charge in particular of the training of the high-level Technicians, the engineers halieutes and oceanographers biologists (Masters, DEA and PhD). Moreover, it can retrain officers firms based on their needs.

Four types of courses are taught: it acts the academic formation, the engineers halieutes, the vocational qualification (Bac +3) and the vocational training lice retrain staff of enterprises according to their needs. Training activities are performed by a permanent team of 17 people (including 2 Professors, 13 Lecturers and two assistants) and missionaries from foreign universities (Anonymous, 1995).



a) Academic formation: Master of Oceanography General (Bac +4) until Doctorate in Applied Ocean Science

The oceanography remains one of the specializations exempted at the Institute. Only the teaching program evolves gradually according to scientific progress and especially of the needs for the matter country for the marine science and halieutics. In fact, mastery of general oceanographic research was the first training in marine science that was created in 1972 within the former Marine Station of Toliara in which were trained each year about ten students with the Bachelor level in Natural Science. On the other hand, the sector DEA in Oceanology applied only emerged a decade later, precisely in 1982. From 1998, problems relating to environmental quality and halieutics products, production (responsible fisheries and aquaculture) concern the policy makers in the country and donors. Also, special mention was reserved for the sustainable management of resources and the marine and coastal environment in education in Master and DEA (case studies). Furthermore, to better address this concern, the former Master General Oceanographic Research exempted from 1972 to 2001 has been moving towards a new MA in 2002 and titled "Master of Science and Technology of the Sea and Coastal or MAST / ML ", whose recruitment is done at Bac + 2 years of courses in Biological Sciences, by selecting files. Masters graduates can continue their training until DEA (5 years) and Doctorate (Bac +8) by identifying specific topics.

b) The Training Halieutic Ingéniorat: (Bac + 6 years)

The training is closely linked to industry needs Fishing/Aquaculture industry and marine and coastal environment. It is a multidisciplinary training designed to train senior government and private companies. Admission is by competitive examination for holders of a diploma in agricultural engineering or a master's degree in natural sciences or marine. The training is carried out as requested by the fisheries administration.

Between 1987 and 1992, he has been trained 50 fishery engineers in Madagascar in the IH.SM. This training was made possible through the project funded by the FAO / UNDP MAG/84/002 entitled "Fisheries development and management training». While these frameworks have contributed significantly in the development of fisheries resources and associated economic representing a proportion of GNP. Needs senior fisheries scientists are greater not only because of the political development of the fisheries sector and aquaculture in general, but to prepare for the changing of existing frameworks (that is to say, the 50 engineers currently position) whose average age is relatively high (around 52ans). Thus, the fisheries administration plans to restart a second training of halieutics engineers from 2009 and for a period of four years (2009-2012) which will be financed by ADB; the aim being to train after 4 years 40 halieutics engineers.

c) Training for job: (Bac + 3 years)

The path Technician sea and coastline was established at the beginning of the year 1998 within the framework of the Programme of Reinforcement of the Higher education cofinanced by the French Mission for Cooperation and the Ministry of Higher Education and continues to date to win the Bachelor of Marine Science. The options are directed mainly

towards Fishing, Aquaculture, Quality Control in fishery products, the management of marine and coastal biodiversity. The training lasts three years with courses in business or in rural communities. Recruitment is by competition for the baccalaureate Scientific C and D.

d) Vocational Training

This field of study has made, following requests by companies for fishing and aquaculture, following the identification of needs made by the team of the IH. SM. Educational programs are developed jointly with the heads of companies. This type of training, although recent takes on increasingly important and rapidly evolving with the development of the Malagasy economy. Two specialties have emerged until now : they are the shrimp biologists and the responsible for quality control and hygiene in the production chain (HACCP). The length of training varies from 1 to 5 months depending on the specialty and the level of training.

e) Training Program

To get a general idea of the types of training offered in this Institute, the tables below present successively the curricula of the first year until Master1.

Table 2: Curriculum in the first year undergraduate

UV	TITLE	Material	Number of Hours		
			AND	ED	Total
UV <sub>1</sub>	BIOLOGY 1	Cell Biology	30	55	85
		Animal Biology	30	50	80
		Plant Biology	30	50	Eighty
UV <sub>2</sub>	ECOLOGY	Ecology / Ethology	30	50	80
		Geological History of Madagascar	Ten	20	30
UV <sub>3</sub>	SCIENCES 1	General Mathematics	25	50	75
		General Chemistry (Inorganic, Organic, Analytical, Atomistic)	35	60	95
		Chemical Thermodynamics	25	40	65
UV <sub>4</sub>	COMMUNICATION 1	French	20	40	60
		English	20	40	60
		Information	Ten	50	60
		Conferences	15		15
		Impregnating: - Mangroves		15	15
		- Reefs		15	15
		- Fishing and Quality Products		15	15
		- Pollution		15	15
		- Erosion and Dune		15	15
		TOTAL	280	580	860

Table 3: Curriculum in second year undergraduate

UV	TITLE	Module	Number of Hours
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			AND	ED	Total
UV <sub>1</sub>	BIOLOGY 2	General Microbiology	30	50	80
		Marine Fauna and Flora	50	60	110
		Coastal and Marine Biodiversity	25	50	75
UV <sub>2</sub>	OCEANOGRAPHY 1	General Oceanography	75	150	225
UV <sub>3</sub>	PHYSIOLOGY	Of Animal Physiology	20	20	40
		Plant Physiology	20	20	40
UV <sub>4</sub>	SCIENCES 2	Probability and Statistics	25	50	75
		Structural biochemistry	25	25	50
		Physics	15	30	45
UV <sub>5</sub>	COMMUNICATION 2	French	15	30	45
		English	15	30	45
		Information	Ten	30	40
		TOTAL	325	545	870

Table 4: Curriculum in the Third year of undergraduate

UV	TITLE	Material	Number of Hours		
			AND	ED	Total
UV <sub>1</sub>	BIOLOGY 3	Applied Microbiology (food and environmental)	20	40	60
		Genetics and Evolution	15	25	40
		Metabolic Biochemistry	20	25	45
UV <sub>2</sub>	OCEANOGRAPHY 2	Oceanography analytical and descriptive	20	25	45
		Marine and coastal ecosystems (structure and functioning)	20	25	45
		Sampling Technique and Data Treatment	20	20	40
UV <sub>3</sub>	COMMUNICATION 3	Technical english	Ten	15	25
		Installation and project management	Ten	15	25
		Technical Writing		15	15
		DEPUTY Total1	135	205	340
UV <sub>4</sub>	PRODUCTION	Fishing Technology of production, storage and processing	50	100	150
		I Aquaculture: aquaculture technology, food, disease in aquaculture	35	65	100
		Quality control of products, HACCP	35	65	100
		3 months internship in companies	3 months		100
		SUBTOTAL 2	120	230	450
UV <sub>5</sub>	ENVIRONMENT	Marine and coastal biodiversity (Development and Conservation)	25	50	75
		ICAM / GIS	35	65	100
		Study of environmental impacts	40	65	105
		Environmental Ecotoxicology	25	45	70

		Stage 3-month field	3 months		100
		DEPUTY Total3	125	225	450

Table 5: Curriculum in First Year of Master

UV1	TITLE	Material	AND	ED / P	Total
UV <sub>1</sub>	BIOLOGY 4	Fisheries Biology	20	25	45
		Marine Biochemistry	20	25	45
		Operational oceanography and climate change	20	25	45
		Sociology of marine and coastal	15	20	35
UV <sub>2</sub>	ANALYSIS OF DATA	Biostatistics	20	25	45
		Geographic Information System	20	20	40
		Population dynamics of exploited marine resources	20	25	45
UV <sub>3</sub>	ECOLOGY	Digital Ecology	20	20	40
		Microbial ecology of marine	20	25	45
		Scuba diving	Ten	50	60
UV <sub>4</sub>	SCIENCE OF WATER	Science and technology of water	15	25	40
		Marine Pollution	15	25	40
		Alternative energy and renewable	15	25	40
UV <sub>5</sub>	AQUACULTURE	Aquaculture	20	30	50
		Parasitology and Pathology in Aquaculture	20	20	40
UV <sub>6</sub>	MANAGEMENT	Quality Management	20	20	40
		Corporate Culture	20	20	40
		English	15	25	40
		TOTAL	325	450	775

Table 6: Curriculum in Second Year of Master

Material	AND	ED	Total
Research Methodology	25	25	50
Food Chain and aquaculture	25	25	50
Coastal and Marine Protected Areas	25	25	50
Ecotourism and Environmental Communication	30	30	60
Environmental Modeling	25	25	50
Law of the Sea	20	Ten	30
TOTAL	150	140	290
Preparation of research project (documentation, methodology)			
Course on land or in a business	6months		
Processing and Analysis, Writing and Oral Defense of Memory	3months		

f) Partners

In order to be able to carry out its objectives, the IH.SM diversifies its partners according to its activities (training, research, consulting)). These are:

- Academics: University of La Reunion (School of Life or ECOMAR) IUFM: University Institute of Teacher Training; ARVAM Reunion (Association for Research and Valorisation Marines), Fisheries Department of Rennes (ENSA), Fisheries Department in Toulouse, Free University (Marine Biology) from Brussels, University of Mons (Belgium), University of Aix-MarseilleIII/CERAM, University of STAVANGER (Norway) and Brown University (USA).
- Agencies and NGOs: Department of Fisheries and Aquaculture; GAPCM (group of fish farmers and fishermen of shrimp from Madagascar); CGDIS (Commissioner General for the Integrated Development of the South); CRD in Fort Dauphin (the Area Development Committee ) CNRE (National Research Center for the Environment); ANGAP (National Association for the Management of Marine Protected Areas); PACT Madagascar ; PNR (National Research Programme shrimp); FRONTIER Madagascar (UK); REEF DOCTOR (UK); BLUE VENTURES (UK), WCS (Wildlife Conservation Society), WWF Madagarscar; IRD Madagascar and Reunion ; Marseille CEMPAMA (Brittany-France), Lycée Maritime Bourcefranc (Charente Maritime);
- Private Enterprise: AQUAMEN ; REFRIGEPECHE (West and East); Group UNIMA (AQUALMA/ACB) ; AQUAMEN FISH; COPEFRITO (Complex Refrigeration deToliara); QMM.SA Fort-Dauphin; GLACIER HOTEL Antananarivo ; INDOSUMA Toliara; Company MUREX International Toliara.

g) The means implemented

The supported funding for the completion of the training are as follows:

- o additional hours of teaching and coaching camp will be supported on the state budget allocated to the University;
- o mentoring that is to say, the monitoring of students, handouts, study tours and practical work in the field, the travel expenses of foreign missionaries, the graduation ceremonies, the secretariat and administration are supported by student fees, which rise from one million MGA (1,000,000 Ariary (Ar 1 million = \$ 112US) for the first year, one million six hundred thousand MGA (1,600, 000 Ar = \$ 170US) in Master 2.

Concerning the existing infrastructure such as classrooms, laboratories (see Table 7), they are rather old and of insufficient capacity, which limits the number of students only to thirty students per class, while demand is high enough because it is the only higher education in marine science existing in Madagascar.

Comment [MAKN1]: IDENTIFIED INFRASTRUCTURE NEED

Table 7: Infrastructure existing at IHSM, their current status and identified infrastructure need

Designation	Comments	Identified need
3 classrooms capacity 30 persons	State plea	1 classroom to be rehabilitated
1 conference room capacity 50 persons	Good condition,	complete with furniture (30 tables, 60 chairs)
1 video conferencing room	Good condition	Equipment to complement (equipment for visioconference)
1 Laboratory of Microbiology (Quality Control)	Living up to standards building and equipments	Room and microbiological equipments (ask financing near the ministry for fishing)
1 Laboratory of Marine and Environmental Chemistry		Equipment to complement (GIC: rotary evaporator, multi parameters, pH measures, conductimeter, salinometer, GPS, Dissolved Oxygen)
- 1 Laboratory of Marine Biology		To refurbish and equip (5 computers, 5 binoculars, books for identifying marine animal and vegetals)
- Computer room for Technicians	Bad condition	10 computers with accessories, 10 inverters
- Computer room for Masters Students	Bad condition	10 computers with accessories, 10 inverters
1 Library	No computer, security system / flight to establish	2 computers with accessories, 1 inverter, 1 photocopieuse, 1 printer, books
1 Oceanographique National Data Center	04 computers	-
1 hatchery center magnification (cucumber / sea urchins)	Application Center functional	-
1 diving center	New room	Materials of diving (ask financing near the PROGECO)

Comment [JRS2]: I assume "Inverter" in this section is actually a UPS.

## h) The opportunities

Mastering: Teacher in secondary schools, Research Assistant, Production Technician, Technical Advisor of the devolved administrations; Economic Operator.

Halieutic Engineer: Senior administration of fisheries and aquaculture, production manager; Teacher Researcher, head of company and head of farm in aquacole company, development agencies, technical assistant; planner and developer of the littoral; Fisheries Resource Management, Economic Operator.

Senior Technicians: Production Technician, Technician aquaculture; adviser in the devolved administrations; Economic Operator.

## i) Monitoring and Evaluation

Student evaluation is done in two sessions in each subject. Each unit of lesson is definitively acquired when the average of the notes of the matters which make it up is equal at least 10/20. There is compensation for matters within each unit of lessons.

On the other hand assessment and monitoring of the training is based on five criteria are consistency, effectiveness, efficiency, effectiveness and relevance of training.

- For consistency, we try to identify the relationship between training objectives and the proposed organization, the links between training programs and the local context;
- Linkages between awaited results and the organization proposed in formation; the role of the actors implied in the formations.
- Efficiency is measured by the relationships between training objectives and outcomes (qualifications and skills) in terms of results and certification of skills; satisfaction ratings of "users" in the report required skills / competencies acquired (surveys are conducted for this purpose).
- The efficiency will be judged on the relationship between resources, the means and methods of their use, links with the results obtained in the short and medium term, the degree and manner of use of existing resources, the degree of involvement of different actors in the implementation of training and the role of SC in the design and implementation of training
- The effectiveness covers the following: the relationship between the "estimated" and "realized" the effectiveness of the implementation of training programs; the effectiveness of alternate teaching (as required in the workplace ) and meeting deadlines.
- Finally, the relevance that relates to the degree of compatibility between the design of training programs, engineering, training and educational engineering, the effects on the ground and socioeconomic environment training projects and the quality of steps engineering training and the quality of teaching engineering (that is to say the link

between conceptual model of alternation and place learning), and changes seen in the field by "users" of trained potential.

j) Development of institutional capacity within the IH. SM

Figure 5 presents the results of the institutional capacity of the IHSM (1995 to 2009).

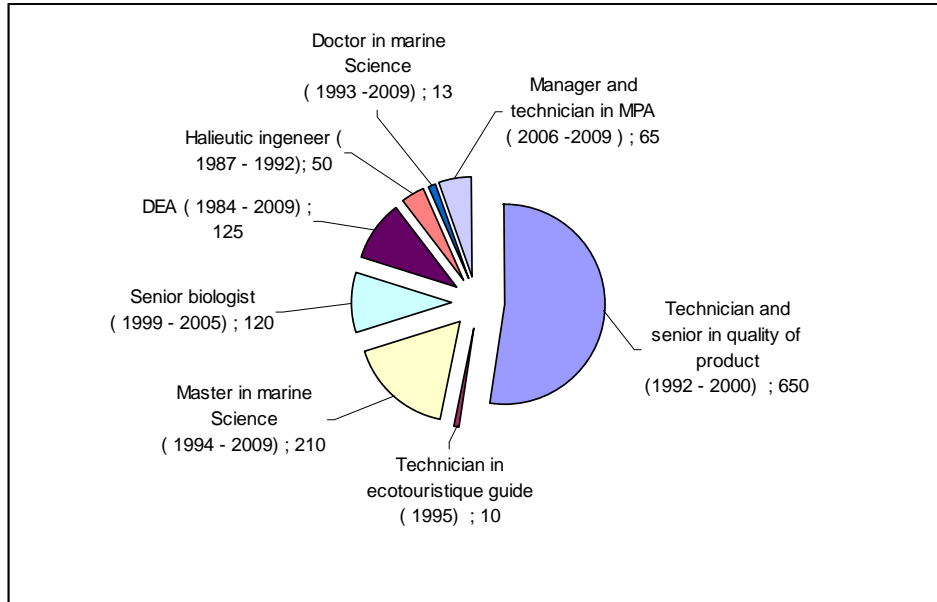


Figure 5 : The institutional capacity of IH.SM

k) List of theses published in IHSM

110 Memoirs of Master products (2002-2009)

- The community management of marine and coastal resources in the area of Anakao / Nosy Ve.Cases FIMIMANO
- Mastery of procedures for the implementation of ISO 9001 version 2000 in the AQUALMA
- Study of the microbiological quality of treated octopus society COPEFRITO
- Study of quality of post larvae of P.monodon and conditions of animal breeding nursery in vis-à-vis survival raceway.Case farm Aqualma Besalampy
- Influence of physicochemical parameters on the evolution stages of moulting of juvenile P.monodon. If the farm Aqualma Besalampy
- Study on the state of the fisheries and aquaculture sector in the region of Mahajanga
- Study of economic and ecological impacts of tourism in the area of Anakao / Nosy Ve (SW Madagascar)



- Improving quality of octopus in the collection areas of society COPEFRITO
- Diagnosis of the replacement system for sequential water in ponds shrimp P.monodon magnification in the farm Aqualma Besalampy
- Adequacy of the procedures of transfer of post-larvae production of farm Besalampy
- Development and implementation of a more effective screening of piscine diseases.Cases of yersiniosis and parasitic
- Pressures and threats to the reef ring Nosy ve, Anakao (Madagascar SW)
- Interest of special stains for the study parasitopathologique and diagnosis of diseases of Penaeid shrimp.Cases of laboratory domestication center Moramba Aqualma
- The fisheries activities in the region Andavadoaka
- Contribution to the establishment of a geographic information system for the implementation of integrated management of coastal areas. Case of the Great Reef of Toliara
- Study of alternative activities to fishing deal with the conservation Andavadoaka
- Study of environmental impacts on the installation of the modular shrimp hatchery CNRO Nosy Be
- Biotechnology in raceways: optimization of growth, survival and nutrition rates of post larvae shrimp P.monodon and P.indicus
- Contribution to the study of the fishery for octopus Andavadoaka
- Rural development: example of creating income-generating activities, the pilot farm of Penaeid shrimp Ambinanibe Fort Dauphin
- Contribution to the integration of social impact assessments in environmental impact studies: the case of extension of the Port of Toliara
- Contribution to the establishment of an integrated management plan for the coastal zone: case Evatraha Fort Dauphin
- Study of environmental impacts of production and use of spirulina. Cases of in natural spiriculture Ankoronga
- Contribution to the study of biodiversity of Lake Mananivo region Anosy
- Contribution to the development of an integrated management plan of renewable natural resources of the lagoon Mananivo Fort Dauphin
- Establishment of a protocol study for evaluation of plankton species burrowing in the bottom clay
- Analysis of the processing quality of processed cucumbers Toliara. Cases of *Holothuria scabra*
- Study on fishing practices and pressures in the Bay of Diego
- Impacts of the massive proliferation of *Upogebia* in the inlet canal on Biosafety a shrimp farm. Case of AQUALMA Besalampy
- Study of technical and economic feasibility of production of spirulina. Resource available
- Influence on vibrio growth and survival of larvae of P.monodon in the LGA Hatchery
- Efficacy of water treatment with the seed of Moringa horn. Case of COPEFRITO
- Study of ecological and socio-economic farming pilot tilapia in floating cages on the lake in Toamasina Rasoabe

- Contribution to the assessment of impacts of human activities in the watershed Onilahy
- Recyclable organic waste treatment by composting. Case of Aqualma Besalampy
- Contribution to the study of the distribution and the traditional use of young Penaeid shrimp in the two estuaries of the Bay Ambaro
- Contribution to the study of catches of sharks through artisanal fisheries. Case of the Bay of Antongil
- Contribution to the development of strategies for community management of sensitive ecosystems on the coast of the Bay of Antongil
- Contribution to the management of critical situations in shrimp aquaculture. Case Mahajamba
- Microbiological analysis of pond water shrimp farming in society AQUAMEN
- Contribution to the study of small pelagic industry in the region Andavadoaka
- Impacts of tourism in the region of Toliara. If Ifaty / Mangily and Anakao
- Technical supply farmed tilapia monosex. Case of the farm Milaso Andranovelana
- Impact of the extension of factory premises on the hygienic quality of products. Case of Captain Pablo Mananjary
- Port performance of P.monodon larvae in the new pools of prefattening SOMAQUA
- Evaluation of the exploitation of marine and coastal resources in the region Andavadoaka
- Spatial and temporal analysis of the abundance and diversity of coral reefs in the Bay of Antsiranana
- Study of the competitors P.monodon farming. Identifying sources of contamination. Case of LGA
- Optimizing quality and quantity management in the culture environment magnification P.monodon shrimp. Case of Aqualma
- Assessing the abundance and study the marketing of sea cucumbers in the Bay of Diego Suarez
- Study of wastewater treatment. The case of shrimp processing plant LGA OSO Madagascar
- Findings of the perception by the population living near the community management of natural resources. Case of the fokontany Antanamitarana
- Test magnification caged crab Scylla serrata in mangrove Belo/Tsiribihina
- Evaluation of the potential flora for the establishment of a community pool
- Estimating the growth of species exploited by the traditional fisheries of the region Boeny
- Marking of traceability information products manufactured Aquamen-EF
- Comparative study of 2 systems grow shrimp P.monodon: direct seeding and breeding with pre-magnification
- Contribution to the evaluation of the impacts of traditional fishing in the coral reef Sarodrano, SW Madagascar
- Activities and proposed development of traditional fisheries to fish in the village of Ankilibe, Southwestern Madagascar

- Influence of the spatial distribution of basins on the growth performance of the *P.monodon* Aquamen-EF
- Comparative study on growth and survival of shrimp *P.monodon* face density in the basin of magnification. Case of farm LGA
- Study of the effectiveness of fixation plates in larval rearing tanks in order to improve the production of juvenile sea cucumber *Holothuria epibionts scabra*
- Study of the essential parameters used in the creation of marine reserves. Case of Ankilibe
- Prospecting sites grow sea cucumbers in the wild in the South West of Madagascar. Cases of St Augustin to Morombe

#### 40 Memoirs of Managers in Marine and Coastal Protected Areas (2006-2008)

- Inventory of flora and marine fauna in the marine park Mananara
- Species composition of catches from traditional fisheries on the great reef of Toliara and its relationship to the food chain
- Feasibility study of establishing a mechanism for participatory resource management and conflict resolution
- Development of ecotourism in the region Anakao, South West of Madagascar
- Contribution of ecotourism benefits the local population of the village of Belo sur Mer
- A proposed plan for ecotourism Andavadoaka
- A proposed conservation plan for the future CMPA Velondriake / Andavadoaka
- The socioeconomic impacts of the marine extension of the National Park Kirindy Mite
- Identification of alternative techniques to pressure on natural resources of the CMPA Nosy Hara
- Identification of biological indicators of the health of the marine environment. Case of the marine park of Nosy Antafana
- Indicators of marine environmental degradation in the CMPA Sahamalaza (North Western Madagascar)
- Impact of exploitation of marine species and coastal development on the socio-economic periphery Sahamalaza
- Profits from the marine park Mananara
- Analysis of the causes and origins of pressure on the island of Nosy Hara
- Socio-economic and cultural future CMPA Andavadoaka
- Identification of sites of interest for the future conservation CMPA Andavadoaka
- Identification of sites of interest for future CMPA Nosy Ve
- Identification of sites of interest for future CMPA Nosy Ve
- Impacts of scuba diving on ecotourism Sahamalaza
- The organizational system of the population for conservation
- Enrichment of specific socio cultural villages bordering the CMPA Nosy Hara
- Contribution to the enhancement of the socio cultural. Case Itampolo
- Contribute to the development of communication technologies for the management of CMPA

- Legality of a plan of social and environmental safeguard against the introduction of the National Park Sahamalaza
- Evaluation of the park's cash flow Kirindy Mite Morondava
- Human Resource Management. Case of Kirindy Mite
- Impacts of Diving on ecotourism and biodiversity Anakao
- Improved techniques and equipment for fisheries management and sustainable environmental resources
- Feasibility study of the implementation of various management concepts use of marine space
- Implement a plan of restoration and conservation of resources and habitats of the Great Reef of Toliara
- Survey sampling farafatse impacts: the case for the manufacture of canoes in the area Mikea
- Study the establishment of a protected area and community Maromena Befasy
- Analysis of problems between residents and managers on the zoning of Masoala Marine Park
- Developing a management plan for the conservation of island Nosy ve
- Advantages and disadvantages of a concession in the MPA Nosy Antafana
- Analysis of potential resources of Andringitra National Park for a financial sustainability: the feasibility of increasing revenues by diversifying schedules
- Identification and management of traditional fishing pressure on the great reef of Toliara
- Contribution to the improvement of the monitoring system of the marine park of Nosy Antafana
- Development of the management of controlled use area in terms of exploitation of *Scylla serrata* in the National Park Sahamalaza
- Analytical evaluation of the human resources function: the case of Andringitra National Park

#### 125 Memoirs of DEA (from 1984-2009)

- Test experimental production of *Brachionus plicatilis*, for rotifer feeding larvae of sea bream *Sparus aurata*.
- Distribution of factors temperature, salinity, dissolved oxygen and density of shelf waters northwest of Madagascar
- Photosynthetic pigments and primary production of surface waters of the continental shelf northwest of Madagascar
- Study of primary production in the mangroves for feeding bivalve
- Observations on penaeid shrimp from the North West coast of Madagascar
- Influence of the nature of the substrate on the growth of the oyster *Crassostrea cucullata* Born in mangrove Beloza Sarodrano, Toliara South West of Madagascar
- Bathymetric distribution of Penaeid shrimp in the bay Ambaro
- Mortality and immediate additional penaeid shrimp caught
- Contribution to the monograph of Nosy Be Island Tanikely
- Marine turtles in the southwest of Madagascar: literature review and survey fishermen: research on biometrics and power of the green turtle *Chelonia mydas*

- The methane fermentation applied to energy recovery from biomass algo-oceanic southern Madagascar
- Study of the composition and evolution of phytoplankton in the surface region of Toliara Sarodrano
- The lobsters used in the extreme south of Madagascar: ecological and fisheries biology
- Contribution to the study of crawfish bioecological operated in the South East of Madagascar
- Bio ecology and exploitation of crab *Scylla serrata* in the region of Toliara
- Contribution to the biological study of a species of edible sea urchin *Tripneustes gratilla* on the fringing reef of Toliara region Songoritelo Madagascar
- Contribution to the study of the oyster *Crassostrea cucullata* in the region Sarodrano. Terms of Miliau, biology and growth
- Study of the biological parameters of the crab *Scylla serrata* in mangrove North West Madagascar
- Approach bio-ecological and socio-economic holothurians Toliara Coral Reef
- Study of the dynamics of a fishery: the case of the Bay of Toliara, southwest of Madagascar
- Study of carrageenan extracted from seaweed in the region of Toliara in southwestern Madagascar: chemical structure and industrial value
- Organic fertilization in aquaculture: use of effluent from biogas seaweed
- Study of *Eucheuma striatum* and *E. denticulatum*. Stock assessment and physical and chemical characteristics of carrageenan for their economic exploitation
- Preliminary study of colloid extracted from red algae of the three region of Toliara: *Gelidiella acerosa*, and *Gracilariopsis lamaneiformis polyopia intricatus*
- Bio ecology *Cypraeacassis rufa* in the fringing reef Songoritelo, South West of Madagascar
- Bio ecology of *Turbo marmoratus* in the fringing reef Songoritelo, South West of Madagascar
- Fisheries Experimental first FAD in the region of Toliara, southwest of Madagascar
- Experimental cultivation of the red alga *E. striatum* on the fringing reef Songoritelo, Toliara
- Biology and traditional fishing Penaeid shrimp in the estuary of the Onilahy
- Temporal variability of fish populations of the mangrove Sarodrano
- The octopus reef areas of southwestern Madagascar: Biology and traditional fishing
- Change spatiotemporal stand plankton in water, sediments and stomach contents of shrimp fishing area on the east coast of Madagascar
- Modification of morphology and sediments of large reef Toliara. Impacts on living resources and fisheries
- Ecology, biology and exploitation of two species of sea cucumbers and aspidochirotés *Bohadschia vitiensis* *Holothuria scabra* var *versicolor* on the great reef of Toliara
- Study of fishing on foot on the collection of coral fringing reef flats between the villages of fishermen Maromena, Befasy and Beheloka

- Study of fishing on foot on the collection of large reef flats of Toliara
- Contribution to the study of biological and ecological Artemia in Madagascar
- Study of spatio-temporal planktonic dinoflagellates in the bay of Toliara in Madagascar Southwest
- Bio ecology and exploitation of octopus in the Masoala Marine Parks, South Eastern Madagascar
- The coral reef: a marine ecosystem with vital roles. Salary Survey bio sociological North Ifaty / Mangily, Anakao Beheloka and South West of Madagascar
- Study of the selectivity of fishing gear traditional shrimp
- Study of the distribution of macrobenthic fauna in plots Marine Masoala Marine Park
- Inventory and mapping of benthic macrofauna and macroflora species in the reef ecosystem of the plot Marine Ambodilaitry Masoala Marine Park, northeast of Madagascar
- Bio ecology of edible bivalve molluscs and importance of the establishment of marine management in the three plots almost Isle of Masoala
- Spatio-temporal zooplankton in the Bay of Toliara, southwest of Madagascar
- Contribution to the testing of the two plots poulpiers marine (Masoala and Tanjona) Masoala Marine Park, northeast of Madagascar
- Contribution to the study of spatial-temporal and ecological study of the behavior of benthic dinoflagellates in the bay of Toliara
- Contribution to the study of the ratio of shrimp / fish by shrimp trawlers Industrial Zone B, North West Madagascar
- Integrating traditional ecological knowledge in the study of reef resources. Case of the Great Reef of Toliara
- Improved crayfishes by the use of bamboo
- Bio ecology and exploitation of two species of sea cucumber *Holothuria notabilis* and *Stichopus aspidochirotes horrens* in the Bay of Toliara, southwest of Madagascar
- Prospective study of coastal marine microfungi South West Madagascar.

#### 50 Memoirs of Ingéniorat Halieutique (from 1986-1992)

- Developing a system for collecting and processing statistical data. Application piroguière fishing in the region of Morondava
- Types of fishing in the region of Manakara
- The artisanal piroguière on the west coast of Madagascar. Impacts of activities of a company collecting and marketing
- The fishing activities in the village of Ankilibe. Developing an evaluation strategy
- Study of losses due to mortality of crawfish ponds in the Lansu Taolagnaro
- The fish market in the region of Toliara: analysis and prospects
- Contribution to improving lobster traps in the region Taolagnaro
- Analysis of Origin Certification and Safety of fishery products in Madagascar
- Feasibility study technical socio economic cage culture in Lake Itasy
- Study for the development of fishery activities in the region Tongobory
- Mounting cooperative fisheries. Case Andranodaro Manakara and Belo Tsiribihina

- Contribution to the study of populations of shrimp in the bay Ambaro. Evolution of average sizes
- Contribution to the assessment of stocks of shrimp in the south of Cape St. Andre Madagascar
- Contribution to the study of the fishery crab *Scylla serrata* in the North West coast of Madagascar
- The production of fingerlings of common carp *Cyprinus carpio* to the station Ambatofotsy. Prospects for improvement
- Analysis of an artisanal fishery in the region of Antsiranana
- The chain bichiques in the Southern Region of Madagascar
- Proposal to redevelop the shrimp fishery in Madagascar. Redefining the period of operation
- Testing Evaluation and analysis of production of Lake Itasy
- Enhancement of fish *Fibata Ophicephalus striatus*
- Determination and analysis of costs and cost of goods of one undertaking artisanal
- Development of artisanal fisheries in the region of Mahajanga
- Diagnosis of small-scale fishing operations of the company TAVEX
- Analysis and tests of reducing losses from a holding langoustière. Case of Lansu
- Improving the production of smoked fish in the region of Mahajanga
- Patchiness of post larvae and juveniles of Penaeid shrimp in the river Ambohinangy Bay Ambaro
- Economic Analysis Center oyster Beloza Toliara
- Financial and economic analysis of Japanese gifts in the fisheries sector
- Proposed construction of a new market of fishery products for the city of Toliara
- Study profitability of different types of shrimp trawlers Malagasy
- Shell crab gratin. Production and quality control
- Fisheries activities in the estuary of the Betsiboka
- Development of a credit system adapted to the small fishery
- Recovery Project of the salmon hatchery Manjakatombo
- Project to create a business operating in the region langoustière Androka
- The place of SOPROMER in supplying the city of Antananarivo
- The eel industry in the region Ambatondrazaka
- Launching of a fishing business: the case of PROPECHE Toliara
- Technical and economic study of semi-intensive *P.monodon* vegetal with food
- Socio-economics of tuna fishing in Madagascar
- Draft Case for fish farms. Case of the station Ambatofotsy
- Development of a technical document economic shrimp in Madagascar
- Use of *Azolla* in rizipisciculture
- Marketing prawns *Macrobrachium* in the region of Toamasina
- Contributing to the improvement of breeding crocodiles Madagacar
- The night fishing activity in the Bay of Toliara
- Effects of integration of a shrimp farm in the Bay Mahajamba. Case of AQUALMA
- Improved drainage and conservation of fishery products in the region of Toliara.

19 doctoral theses (from 1993 to 2009)

- Bio ecology and population dynamics of lobsters Palinuridae Southern Madagascar
- The bio methanation applied to the recovery of energy and agro chemical waste: Development related to environmental protection
- Contribution to the characterization of the strain experienced Malagasy Artemia in aquaculture ponds of saline and rear mangrove Ankiembe Toliara Madagascar
- Study of reproduction of yellowfin tuna Thunnus yellowfin in the Mozambique Channel
- Small pelagics in the South West region of Toliara in Madagascar: Biology, ecology, exploitation and development
- Profiles of the procession of toxic dinoflagellates and bacteria associated with accidents allochthonous food consumption by marine animals approach through shellfish consumed in Toliara Madagascar
- Testing Penaeid shrimp breeding lagoon in the region Anosy. Listing lagoon Ambinanibe Taolgnaro.
- Integrated development and management of biological resources. Application to the region Anakao, South West of Madagascar
- Dynamic traditional fisheries of anchovy, squid and octopus in Southwest Madagascar. Use of tools for managing ocean resources
- Identifying conditions for ownership of the sustainable management of natural resources and ecosystems. Case of the Great Reef of Toliara
- Isolation, chemical characterization, toxicological properties of eupholarine. Principle of fish toxicants Euphorbia Laro and impact studies on fishing Laro
- Adaptation of Spirulina in southern Madagascar in the culture seawater. Development of production structures at village level
- The shrimp fishery in the Bay of Antongil. Systemic approach to eco-catch.
- The seabird colonies of future coastal and marine protected areas of South West, West and North of M / car. Diagnosis ecological and socio-economic sustainable exploitation of the resource.
- Bioecology seahorses in the lagoon of the Great Reef of Toliara. test experimental breeding of seahorses, and sygnathes amphiprions Indian Ocean and / or Mediterranean
- Study of the trophic structure of mesopelagic organisms in the south west Indian Ocean: an approach by the stable isotopes of carbon and nitrogen "

2 PhD Accreditation to supervise research

- Dynamics of populations (lobsters, sea cucumbers and octopus) in response to environmental and anthropogenic pressures. Management of ecosystems and marine and coastal and coastal Madagascar
- Biodiversity of coral reefs of Madagascar

1) The museum



The IH.SM also has a museum called "Museum of the Sea" which was dedicated to Dr. Rabesandratana, the first oceanographer malagasy. It has as main objective the establishment of reference collection and banking of biological specimens. It now houses 60 plant species and 600 species of marine animal. These collections will be for the public (domestic and foreign) wanting to learn and train in the field of environment and marine resources.

The museum is open to the public and the visit is paid. The majority of visitors are students and students from various parts of the country.

m) The strengths and weaknesses of the IH.SM

In the area of training, IH.SM Madagascar is the only institution pioneer and specialist in Aquaculture and Quality Control of products made from marine sciences. For research, it is renowned in the field of tropical aquaculture, marine resources, inventory management, pollution of water and wastewater treatment and sustainable development of coastal communities.

However, it faces some difficulties to achieve its objectives both in the field of training and of research among which include:

- inadequate budget allocated by the State for training and research;
- the capacity of students (classrooms, laboratories) limited to a maximum of 30 students per level;
- obsolete equipment and inadequate materials. The IH.SM can not acquire new materials and equipment with training projects and / or research;
- as in all universities in Madagascar, no enhancement of research outputs (publications, articles in international).

It is in this context that the IH.SM is required to cooperate with various external partners in order to achieve its training and research. The following table summarizes the various projects (training and research) that have succeeded with their respective description.

Table 8: Projects (Training and/or Research) having existed or existing at IH.SM

N°	Source of Funding and Leadership	And narrative	Cost	Period
1	NORAD Coordinators: - Dr. Man Wai Rabenevanana - Pr Torleiv Bilstad (Stavanger U)	Reduction of marine pollution in the region of Toliara Fort Dauphin  Remediation of marine pollution in large cities M / car	4,000,000 NOK (1000000 NOK / year)  3,500,000 NOK	2003-2006  2007-2010
2.	CUD / Belgium, ULB-MONS Coordinators: - Professor Edouard Mara - Prof. Michel Jangoux (ULB-Belgium)	Tropical Sea Cucumber Farms (sea cucumber) 2nd phase	370,124,000 Euros (€ 74,024,800 / year)  (Counterparty: 179,800,000MGA) (75,960,000MGA / year)	2004-2008
3.	UNESCO - IOC Coordinator: Prof. Edouard MARA	National Oceanographic Data Center	U.S. \$ 50,000 (U.S. \$ 10,000 / year)	2000-2004
4	FADES / WORLD BANK Coordinator: Dr. Christian Ralijaona	Master of Science and Technology of the Sea and Coastal (new curriculum)	U.S. \$ 190,000 (U.S. \$ 95,000 / year)	2003-2004
5	ECABIOLA / CORUS / French Cooperation IRD Coordinators: - Dr. Man Wai Rabenevanana; - Dr. Jean Blanchot (IRD)	Study of water quality and coastal lagoons for aquaculture. Cases of Fort Dauphin	75,000 Euros (€ 35,000 per year)	2004-2006
6	USAID-PACT Madagascar Coordinators: - Dr. Man Wai Rabenevanana; - Michel Dufils (PACTMD)	Rural Development, Fisheries Management Ambinanibe traditional, Fort-Dauphin	U.S. \$ 64,000 (U.S.\$ 32,000/ year)	2004-2005
7	Mc ARTHUR FOUNDATION and ANGAP Coordinators: - Dr. Jacqueline Razanoelisoa; - Dr Guy Suzon (ANGAP)	Training Managers and Technicians (APM GAPMAC) (First Phase)	U.S. \$ 375,000 (93,750 U.S. \$ / year)	2006-2008

	- Dr. Man Wai Rabenevanana	Sustainability training GAPMAC (Establishment of reception facilities on land) 2 <sup>nd</sup> Phase	U.S. \$ 150,000	2009-2010
8	CUD BELGIUM Coordinators: Dr. Richard Rasolofonirina Dr. Ugor Eikhault	Specialized Training in Ecotourism and BioManagement		2009-2013
9	ADB / PACP Coordinator: Dr. William Rakotoarinivo	Communities Support Program Fishermen (PACP), creation of marine reserves  Training of 40 fishery engineers		2007-2010  2009-2012

### 2.2.1.3. The other universities

Put aside the IH.SM of the the University of Toliara, there is no other academic institutions that provide specialized training in oceanography or marine science. However, within the five other universities, there are departments in which one or some modules related to marine science and fisheries are treated.

#### a) University of Antananarivo

##### \* Training of agricultural engineers

This training takes place within the Higher Institution of Agricultural Sciences or ESSA, formerly known as National School of Agricultural Sciences and ENSA. It was founded in 1963 and was tasked to train engineers for Malagasy primarily to serve mainly the administration of the Forestry and Agriculture, a minority is aimed at senior Administration Fisheries. Admission is by competitive examination for holders of Bachelor Science (C and D). The first year students are selected to be 120 per class. The training lasts 5 years (Rakotomalala, 2006). It is important to note that all professionals working within the Administration Fisheries are from this school.

##### \* Training of Postgraduate Diploma or Diploma in Specialised Studies Environmental Impact Assessment

The training, initiated by the University of the Indian Ocean since 2005, is provided by the Polytechnic higher school of Antananarivo (Ecole Supérieure Polytechnique d'Antananarivo) (ESPA), under the management of the University of Antananarivo in partnership with the University of Bordeaux IV and the institutions of the Region (Reunion, Mauritius). She is currently in its 9th promotion.

**Comment [JRS3]:** I thought that DLIST was helping the Toamasina university do some marine-relevant stuff? This section then goes on to mention several others that offer marine-relevant stuff, if not perhaps oceanography or "marine science" in the strictest sense.

**Comment [MAKN4]:** SHOW RELEVANCE E.G. COURSE CONTENT

His idea was to give postgraduate degree in two semesters, a vocational-oriented design, implementation, monitoring and evaluation of environmental impact studies. Beyond the strict Impact Assessment (EIE) study strategic dimension of environmental impacts (ESIE) is present in the training.

This cycle is designed to train national and foreign experts in environmental impact studies and regional planning for an interdisciplinary and cross-training with a dominant economic and legal. The aim is to enable graduates to adapt to regional circumstances and demands of the authorities of different sectors concerned and private interests involved.

The course is open to nationals originally a member of the IOC (Comoros, Reunion, Madagascar, Mauritius, Seychelles). Currently, it covers all French-speaking countries because the language of instruction is French. It is designed for scientists holding a degree in engineering or a university degree at least four years of higher education. Professionals in the public sector, private sector and associations in all areas affected by the environment, can justify 10-15 years experience, recommended by their employer may submit their applications.

Since its creation, foreign students have always been recruited from the DESS.

The purpose of the training is to enable candidates: (i) to have a general knowledge of environmental information and tools, (ii) better understand the impact and risks of an investment program and (iii) to know the different study methods and procedures and their applications.

Theoretical training is followed by an internship application company that will be publicly supported a bill for graduation.

This course is co-graduate of the University of Antananarivo and the University Montesquieu Bordeaux IV.

\* Evolution of the Diploma in EIA Master 2 entitled "Territories, Environment, Industries

Citation: "Management of the Environment and Territories"

Expertise: Management of natural resources and environment, "Option:" Study of Environmental Impacts "

This is to preserve the achievements of the graduate EIA, while making the improvements recommended by the BMD system. In recent years, the Malagasy universities prepare their migration to the BMD system given the openness and integration of Madagascar in various international and regional organizations (SADC, COMESA, IOC, AUF ...) and also to provide readability of qualifications on the labor market.

The scientific supervision is always at the Polytechnic College, but participation of other institutions, especially at the level of educational influences, is strengthened. These include: the Department of Geography Faculty of Humanities and Social Sciences (FLSH), University of Antananarivo, the DESS Land ESPA at the University of Antananarivo, the DESS Environmental Impact Assessment ESPA of the University of Antananarivo, the Institute for Energy Management of the University of Antananarivo, the Natural Resource Management and Environmental (GRENE) Department of Geography at the University of Toamasina The Department of Ecology, Faculty of Science University of Mahajanga and IH.SM University of Toliara.

This training is functional since 2007, including the level of recruitment is done at the Masters and ingéniorat. But prices will be professed in the new BMD system, according to programs detailed in the tables below.

Table 9: Curriculum Master in EIA

Total hours: 575 hours					
H1	Number of credit hours			310h	30
U1 - 1 General lessons				110h	12
Modules:	TD	Courtyards	Continuous	Control Terminal	ECTS
- Introduction to Environmental Science	10h	20h		/ 20	3.
- Introduction to GIS	20h	20h	/ 20		3.
- Legal environment					
* International Environmental Law		20h	10.		3.
* Case of Madagascar		20h	10.		3.
Total / 60 - Average calculated / 20 - Capitalization of the EU from 30 points.					
U1 - 2 Complementary courses and cross				130 h	9
Modules:	TD	Courtyards	Continuous	Control Terminal	ECTS
- Organization and Management Project	25h	15h		/ 20	3.
- Introduction to Computer	15h	5h	/ 20		2.
- Communication Skills					
* In French	20h	20h	10.		2.
* In English	15h	15h	10.		2.
Total / 60 - Average calculated / 20 - Capitalization of the EU from 30 points.					
U1 - 3 Teaching Specific				70h	9
Modules:	TD	Courtyards	Continuous	Control Terminal	ECTS
- Impact Methodology					
* Environmental Impact Assessment	15h	15h		/ 40	3.
* Environmental audit	15h	15h		/ 40	3.
* Case Study	10h		/ 20		3.
Total / 100 - Average calculated / 20 - Capitalization of the EU from 50 points.					
2 <sup>nd</sup> half	Number of hours and credits			265H	30
U2 - 1 Tools and Methods				145h	9

Modules:	TD	Courtyards	Continuous	Control Terminal	ECTS
- Conferences methods	10h		10.		1
- Development of RDTs EIA	10h	10h	10.		2.
- Application to manage a territory		25h		/ 20	2.
- Sectors generators and receivers of impacts					
* Different types of receptors	30h	15h	/ 20		2.
* Different sources of impacts and risks	30h	15h	/ 20		2.
Total / 80 - Average calculated / 20 - Capitalization of the EU from 40 points.					
U2 - 2 Specific studies: Environmental Economics				50h	6
Modules	TD	Courtyards	Continuous	Control Terminal	ECTS
- Environmental Economics					
* Natural Resource Management		25h		/ 40	3.
* Environmental Economics		25h		/ 40	3.
Total / 80 - Average calculated / 20 - Capitalization of the EU from 40 points.					
U2 - Stage 3				70h	15
Modules	TD	Courtyards	Continuous	Control Terminal	ECTS
- Occupation of a consultant	20h		/	/ 20	2.
- Monitoring progress reports	50h			/ 180	13
Note: 50h monitoring reports of activity corresponds to the supervision of a student					
0					
Total / 200 - Average calculated / 20 - Capitalization of the EU from 100 points.					

Table 10: Method of passing tests terminal  
How to pass tests terminal  
H1

Modules	Time allowed	Nature of test
U1 - 1 General lessons		
Introduction to Environmental Science	3h	Written test
U1 - 2 Complementary courses		
Organization and Project Management	4h	Written test
U1 - 3 Teaching Specific Environmental Economics		
Environmental Economics		
Natural Resource Management	3h	Written test
Econometrics and Environment	3h	Written test

U1 - 4 Specific studies:		
Methodology Impact		
EIA	3h	Written test
Environmental audit	3h	Written test
2nd semester		
U2 - 1 Tools and methods		
Application to manage a territory	3h	Written test
U2 - Stage 2		
Monitoring progress reports	Defense	Oral test

\* The financial resources implemented

The supported funding are as follows:

- Additional hours of instruction and supervision of internships are supported on the state budget allocated to the University;
- mentoring that is to say, the monitoring of students, handouts, study tours and practical work in the field, the travel expenses of foreign missionaries, the graduation ceremonies, the secretariat and administration are supported by student fees, which amount to one million MGA or Ariary (Ar 1 million = \$ 112US) for national and one million five hundred thousand MGA or Ariary (Ar 1,500,000 = 167 U.S. \$) for foreigners.

b) University of Mahajanga

The University of Mahajanga has two departments providing training related to marine and coastal environment.

\* Vocational Training Unit (UFP) in Aquaculture

The region of Mahajanga is the most developed in terms of shrimp farming due to the existence of mangroves conducive to this type of production and broodstock shrimp available in the natural environment. As a result, the Faculty of Sciences of the University of Mahajanga in 2001 established a vocational training unit in shrimp, including shrimp to meet industry needs. The creation of this center has been supported financially and materially by the project FADES / World Bank. The selection (number 30 by promotion) is done in the first year for holders of bachelor's degrees are scientific training lasts three years and whose programs are summarized in the table below.

Table 11: Curriculum in UFP Mahajanga

First Year	Second year	Third year
Chemistry (general, inorganic, organic)	Structural biochemistry	Metabolic Biochemistry and protein biosynthesis
Biology (animal, plant, cell)	Biology of Penaeid	Nutrition of penaeid
Marine Biology	Marine Microbiology	Aquaculture (General, Environmental Aquaculture)
Zoology (invertebrates, vertebrates)	Oceanography (general, physical, chemical)	Study Site and Soil

Geology	Marine Ecology	Pathology shrimp
Rural Sociology	Hydrobiology, Limnology	Study Fish
Paleontology	Hatchery-nursery	Quality control
General Mathematics	Mineral nutrition Navy	Installation Project
Communication (Technical speaking, English)	Communication (French, English, computer science writing)	Environmental Education
		Legal Introduction
		Communication (French, English, computer)

\* Master in Environment Biohydrosystème (EBHS)

It was created in 2007 in partnership with Agrocampus Rennes whose creation was supported by the project MADES / FSP. He is a Master organized in four semesters each of which are credited 30 ECTS credits (Ranarijaona, 2006).

The training is open to students holding a degree in Natural Sciences, which meets the core in Master1 and selected by the selection committee (all counts option + Dean).

The program (detailed in tables below) includes ten modules per semester most of whom are compulsory and the remainder choice. Each module consists of 30 hours of instruction (ET + T + P).

\* Each module is credited with 1-2 credits ECTS, and the modules are grouped into teaching units. The personal work (75-90 hours released the schedule) will be credited 6 ECTS. A total of one semester is 30 ECTS.

- The first semester of the Master (S1) is a common core for all Masters students whose modules are distributed as follows.

Table 12: Master in Education Program in Environment EBHS

SEMESTER 1				
CONTENTS	AND	ED	EP	TOTAL
Computer / Statistics / Modeling	12.5	25	12.5	50
English	0	0	25	25
Scientific Communication	0	0	25	25
Project Management / Working Methods	18.75	12.5	0	31.25
Socio-eco-cultural	12.5	6.25	0	18.75
Ecotourism and Community Development	12.5	0	12.5	25
General Ecology	25	25	12.5	62.5
Marine Biology	18.75	6.25	6.25	31.25
Technical Documentation	0	6	6	12
Experimental Techniques	6	0	12	18
SEMESTER 2				
Contents	Commune (required)	Optional	Volume Schedule	
Bioclimatology	X		30h	



Physical and watersheds: land and inland waters	X		30h
Types of inland waters (river, pond, lake, estuary, mangrove ...) (1) and (2)			30h
Biology of Aquatic Animals (1) (Locomotion, reproduction, age and growth, feeding, osmoregulation) (crustaceans, molluscs, fish)		X	30h
Biology of aquatic plants (2)		X	30h
Microbial Biology (regulatory)		X	30h
Phylogeny - evolutionary biology	X		30h
Methods for mapping and environmental monitoring (mesology and biology, landscape ecology) (2) (3),	X		30h
Languages (French and English)	X		30h
Environmental Law (including the Water Code) and Environmental Education	X		30h
Environmental Economics and Resource	X		30h
Physico-chemical and microbiological water	X		30h
GIS	X		30h
Hydraulics and Risk Management	X		30h
Personal activities (literature, project, critical articles, news monitoring, ...)			90h
<b>SEMESTER 3</b>			
Contents	Town mandatory	Optional	Volume Schedule
Ecology and biotic compartments of water systems (1) and (2),	X		30h
Functional dynamics of the major types of aquatic environments (1) and (2)	X		30h
Ecotoxicology and Environmental Risk Management		X	30h
Wastewater		X	30h
Biodiversity and bioindicators: Impacts of human activities and methods of biomonitoring in aquatic environments (1) and (2)	X		30h
Course land (approximately one week) and operating data collected	X		30h
Applied Statistics	X		30h
Hydrology thorough quantitative		X	30h
Paleontology (Palaeoclimates)		X	30h
The Inland Fisheries (1)	X		30h
Management of water systems and biological invasions (population and environment) (2)	X		30h

Aquaculture (fish, shrimp, watercress) (1)	X		30h
Policies and actors related to water systems (water, fisheries, aquaculture, association, ...)	X		30h
Languages (English)	X		30h
Personal work of students: Project Engineer (report + presentation) and literature review related to the placement of S4			90h
SEMESTER 4: STAGE (5 to 6 months)			

Regarding personal works (Semester 3):

This is a literature review individual, if possible in conjunction with the internship semester M2 4.

- Bibliographies: 2-3 references in English at least are required for students. These references must be scholarly articles and not the commonalities found on the Internet.
- A project in small groups (2-4 students) that gives rise to a report and presentation.

Review procedures

- The reviews are conducted after completing 4 modules (but not the end of all modules)
- A score below 7 / 20 in a playoff module, which causes the failure to obtain credits from the Education Unit.
- There is an initial review session and a remedial session (second session) whose rules may be different from the initial examination.
- The credits are granted for 5 years. After remedial training, and in case of failure, the student can:

(1) be renewed for the following (the) unit (s) of instruction he has not had (s) he has to repeat all the modules in that (those) unit (s) of instruction  
(2) pass in M2 but it is mandatory that returns the examinations (s) Unit (s) of instruction he has not had (s) to get his master's degree.

c) University of Toamasina: Management of Natural Resources and Environment s (GRENE)

GRENE department was created in 1999 within the University of Toamasina on the basis of the National Environmental Program (PNE) and the specificity of which is the Wetland Aquatic. At first, it aims to train specialist executives in Wetlands Management Master's level (Bac + 4 years) and DESS (Bac +5). Recruitment is done at least for the holders of two tray (for Masters) and tray 3 for the postgraduate degree. The training lasts two years during which about 18 are offered large modules geared largely on technical subjects and art tools. Students complete an internship of 4 months for the master's level and at least 6 months for the postgraduate degree at the end of their training. The evaluation of theory is based on examinations scheduled in two sessions (1<sup>st</sup> and 2<sup>nd</sup> sessions). From 2008, following requests that have been expressed by many conservation organizations, was established the Professional license (approximately 3 years after the baccalaureate) and with 50 students participating in this training level of the 1<sup>st</sup> year of the first graduating class in 2008.

d) The University of Fianarantsoa

The University of Fianarantsoa through the Institute of Science and Technology for the Environment (ISTE) since 1998 provides a professional training focused on the terrestrial environment. The training lasts two years and leavers will work as technicians in various conservation bodies (eg MNP).

### 2.2.2. Analysis of the situation of higher education in the marine environment in Madagascar

Historically, the educational system of Madagascar has been dominated by general education, theoretical and academic. The training held there only marginally. Currently, there are only four schools that provide technical and vocational training in the field of fisheries, forestry and agriculture:

- the School of Applied Science and Agricultural Technology (ESSA) which trains technical assistants in branches farming, fishing, livestock and forestry;
- higher education that is provided by the University of Antananarivo (College of Agricultural Sciences), which trains executives in agriculture, livestock and fisheries;
- Bachelor vocational aquaculture specialist at the University of Mahajanga;
- IH.SM of the University of Toliara.

The training course on marine sciences, fisheries, aquaculture and provided to the IH.SM is nearly complete to obtain different products (technicians, and executives). By cons aging infrastructure dated 70s and the lack of equipment and facilities are key obstacles to the success of this training. In addition, the low capacity of students, limited to only 30 students per class, is the cause of the relatively fewer specialized professionals in marine science.

### 2.3. INSTITUTIONS RESEARCH (NATIONAL AND INTERNATIONAL)

#### 2.3.1. Background

Many public institutions or NGOs, or other institutions specifically mandated for the conservation and management of biodiversity (eg ANGAP now become Madagascar National Parks or MNP) are involved in research on marine and coastal environment and its sustainable use. Their actions may be:

- o direct: the case of institutions responsible for making decisions and implementing systems for the conservation, protection or monitoring. It may also include service providers who work directly with the application, or the production of documents (maps, publications ....) Used in conservation actions;
- o indirect: through research whose results contribute to a better understanding of the status of marine biodiversity before all appropriate precautionary measures. This is the case of Universities, Research Centers and foreign NGOs working in collaboration or not with the institutions in Madagascar.

Concerning marine research, the blueprint for oceanographic research (PDRO) was developed in 1987. The art direction and action programs set have not been made, for lack of funds.

Three national organizations are engaged in research on marine and coastal environment. It is the National Center for Oceanographic Research (CNRO), the National Center for Research on Environment (CNRE) and the Institute of Marine Sciences and Halieutique (IH.SM). These three organizations are all part of the Ministry of Higher Education and Scientific Research. The CNRE is conducting studies on mangroves and pollution, and CNRO and IH.SM pay special attention to resources, notamment to their biology and ecology, and they focus their activities on fisheries research and aquaculture.

On the other hand, fisheries research activities, including research on shrimp products are exported to almost all, are the responsibility of the National Research shrimp (PNRC), funded by the grouping of fish farmers and fishers Prawns from Madagascar (GAPCM) under the Ministry of Agriculture, Livestock and Fisheries. To these four organizations (CNRO, CNRE, IH.SM, PNRC) involved in coastal and marine environment, we must add various nongovernmental organizations that conduct studies on specific resources and their habitats through conservation project areas and protected marine and coastal.

### 2.3.2. The actual research activities

The research in the marine field began around 1960 and 1970 from teams Station Marine d'Aix Endoume Marseille III based at the former Marine Station of Toliara (now currently IH.SM) and the ORSTOM based in CNRO in Nosy Be. Their work focuses on two main areas:

- i) the identification, distribution and systematics of species in Malagasy waters;
- ii) the biology and the stock assessment of penaeid shrimp from the north-west;
- iii) because of the geographical position of these two centers of oceanographic research, it seems that the species of regions of Toliara and Nosy Be are the most studied. The latest results of work at that time were removed around 1985.

Subsequently, the two national research institutions Oceanography (Marine Station of Toliara become IH.SM, and CNRO Nosy Be) and the National Research Center for the Environment (CNRE) continued or not in cooperation with agencies outside research or development (IRD, WCS, WWF, CARE International, REPC). But generally, research has focused on eco-biological aspects and socio-economic of some commercial species (shrimp, lobsters, fish, shellfish, seaweed, sea urchins ...) and environmental (see Figure 6). Most work focuses on species in the region of Toliara and Nosy Be, and the northeast coast of the island.

Moreover, statistics of production and export of species are produced and marketed since 1985 in the central Directorate of Fisheries and Fishery Resources Officer with the scientific support of CNRO and technical of CSP based on the cards Fishing and Arms Export Companies sheets. In general, all research and statistics have been conducted for management plans and management of fisheries resources exploitation.

In the early 1990s, it was found that the exploitable stocks reached the maximum sustainable catch or overexploitation of certain species such as sea cucumbers and shrimp as dark areas on the biological knowledge of species can not updating the various regulations governing who in most cases date from the 1920s. Moreover, in light of the literature,

recommendations from the knowledge is based solely on a decrease in size of catches and visual observations on the degradation and loss of certain habitats without a study conducted scientifically (no take into account social aspects).

Given this fact, since 1992, the relevant institutions (government and research) have refocused the work towards the understanding of phenomena governing commercial species, introducing the biological, environmental, socio-economic statistics (multidisciplinary). They mainly concern the penaeid shrimp, lobsters, sea cucumbers, large pelagic fish (which are subject to export) and reef fish and small pelagic species that are targets of traditional fishermen.

Currently, the data available and usable in IH.SM regarding 5 areas: environment marine and coastal management of aquatic resources, aquaculture, biotechnology and resource development and pollution and remediation wastewater (see Figure 6).

Regarding the CNRE is a national center that is equipped with the most material and equipment for physico-chemical and bacteriological water and foods. Thus, apart from the research activities focusing on pollution and the environment, this center offers services in the area of physico-chemical water. It also hosts (in the context of achieving a Master's or PhD) trainees from the Technical Department of Antananarivo, students in natural sciences and those of IH.SM.

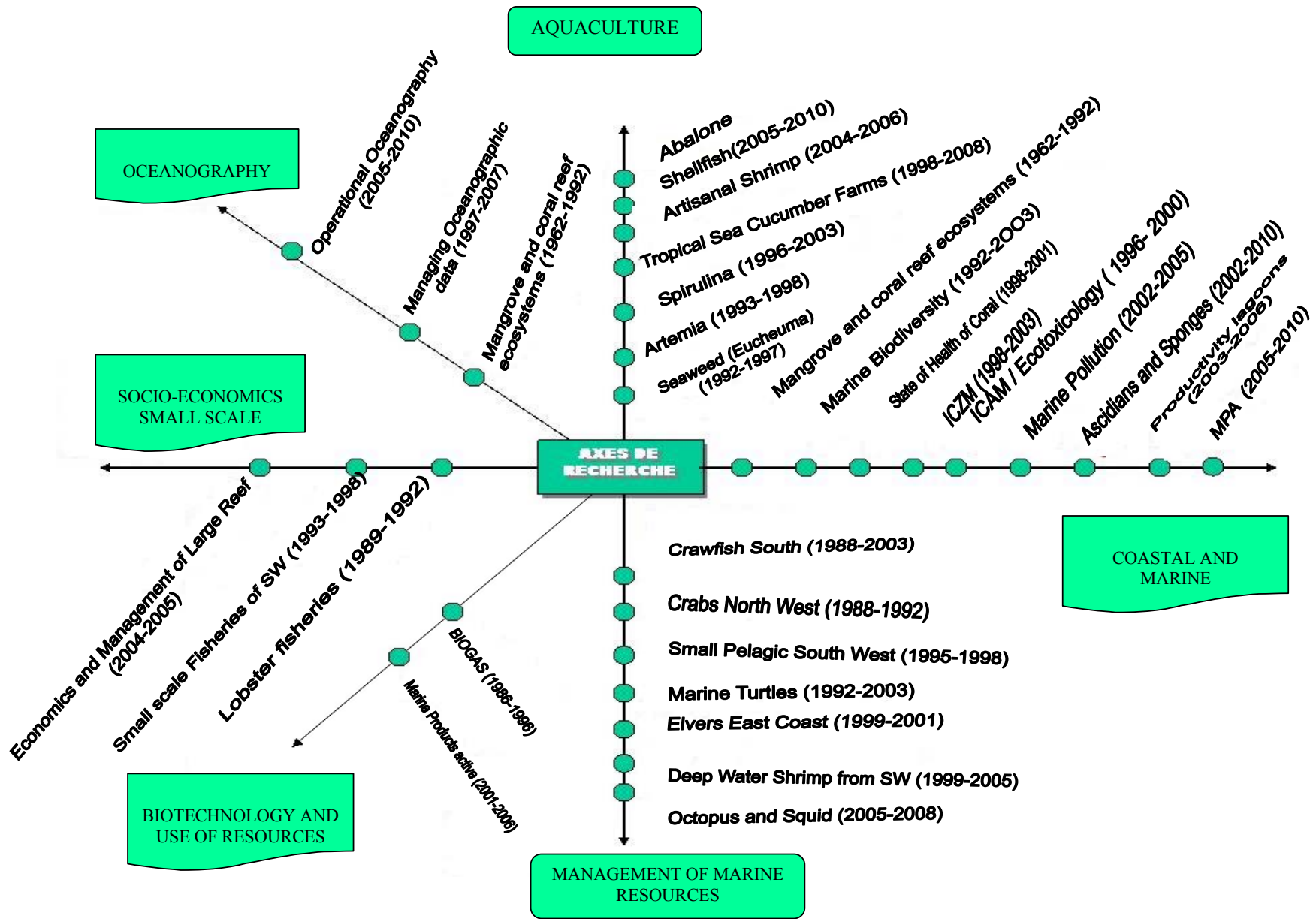


Figure 6 : Research orientations at IH.SM

## LIST ACRONYMS

ADB :	African Development Bank
AMNH :	American Museum Natural History
ANGAP :	Association nationale pour la Gestion des Aires Protégées
AQUALMA :	Aquaculture de Mahajamba
AQUAMEN :	Aquaculture de Menabe
Ar :	Ariary
ARIF :	Agence Régionale Interprofessionnelle pour la Formation
ARVAM :	Association pour la Recherche et la Valorisation Marine
CFD :	Coopération Française pour le Développement
CGDIS :	Commissaire Général pour le Développement Intégré du Sud
CI :	Conservation Internationale
CITE :	Classification Internationale Type de l'Education
CNFTP :	Centre National de la Formation Technique et Professionnelle
CNRE :	Centre National de Recherche pour l'Environnement
CNRO :	Centre National des Recherches Océanographiques
CNTEMAD :	Centre National de Téléenseignement de Madagascar
COBA:	Communauté de Base
COPEFRITO:	Complexe Frigorifique deToliara
CRD :	Comité Régional de Développement
CSP :	Centre de Surveillance des Pêches
DANIDA :	Agence Danoise pour le Développement
DEA :	Diplôme d'Etude Approfondie
DESS :	Diplôme d'Etude Supérieure Spécialisée
DPA :	Direction de la Pêche et de l'Aquaculture
DREFT :	Direction Régionale de l'Environnement, de la Forêt et du Tourisme
DRH :	Direction des Ressources Halieutiques
EASTA :	Ecole d'Application Scientifique et Technique Agricole
EBHS :	Environnement en BioHydroSystème
EDF :	European Development Fund
EEZ:	Exclusive Economic Zone
EIE :	Etude d'Impacts Environnementaux
ENSA :	Ecole Nationale Supérieure Agronomique
ESIE :	Evaluation sociale et Environnementale des Investissements côtiers
ESPA :	Ecole Supérieure Polytechnique d'Antananarivo
FADES :	Fonds de Développement de l'Enseignement Supérieur
FAO :	Food Agriculture and Organization
FLSH :	Faculté des Lettres et des Sciences Humaines
GAPCM :	Groupement des Aquaculteurs et des Pêcheurs de Crevettes de Madagascar
GDP :	Gross Domestic Product
GELOSE :	Gestion Locale Sécurisée
GNP :	Gross National Product
GRENE :	Gestion des Ressources Naturelles de l'Environnement
GTR :	Groupe de Travail et de Réflexion

HACCP :	Hazard Analysis Critical Control Point
ICAM :	Intoxication par Consommation d'Animaux Marins
ICZM :	Integrated Coastal Zone Management
IHSM :	Institut halieutique et des Sciences Marines
IRD :	Institut de Recherche pour le Développement
ISET :	Institut Supérieur de l'Environnement
ISTE :	Institut des Sciences et Techniques pour l'Environnement
ISTN :	Institut des Sciences et Techniques nucléaires
IUFM :	Institut Universitaire de Formation des Maîtres
LCEM :	Législation et Convention sur l'Espace Maritime
MAEP :	Ministère de l'Agriculture, de l'Elevage et de la Pêche
MAP :	Madagascar Action Plan
MaST/ML :	Maîtrise des Sciences et Techniques de la Mer et du Littoral
MECIE :	Mise en Compatibilité des Investissements en Environnement
MENRS :	Ministère de l'Education Nationale et de la Recherche Scientifique
MNP :	Madagascar National Park
MPAEF :	Ministère de la Production Animale et des Eaux et Forêt
MPARA :	Ministère de la Production Animale et de la réforme Agraire
ONE :	Office National pour l'Environnement
ORSTOM :	Office de Recherche Scientifique et technique d'Outre Mer
PACP :	Programme d'Appui aux Communautés des Pêcheurs
PDRO :	Plan Directeur de la Recherche Océanographique
PE :	Programme Environnemental
PGDRC :	Projet d'Appui à la Gestion Durable des Ressources Crevettières
PNAE :	Programme National d'Action Environnementale
PNRC :	Programme National de Recherche Crevetière
PRESUP :	Programme de Renforcement de l'Enseignement Supérieur
QMM :	Quit Madagascar Minerals
REPC :	Réseau des Educateurs et Professionnels de la Conservation
SAGE :	Service d'Appui à la Gestion de l'Environnement
SEE :	Secretary for Environmental Exploitation
SIE :	Système d'Information Environnementale
SIG :	Système d'Informations Géographiques
SOMAPECHE :	Société Malgache des Pêcheries
SOPROMER :	Société des Produits de Mer
SSC :	Système de Sensibilisation et de Communication
TED :	Tourisme et Ecotourisme Durable
UFP :	Unité de Formation Professionnelle
UNESCO :	Programme des Nations Unies pour l'Education
WCS :	Wildlife Conservation Society
WIOLAB:	Western Indian Ocean Land Base
WWF:	World Wilde Fund

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For international institutions, ORSTOM was implemented until 1974 at Nosy Be and its activities are focused on finding shrimp whose research results are used as bases for management of this fishery. In 1997, was created in Mahajanga on the National Research Program shrimp (PNRC) under the Support Project for Sustainable Management of shrimp resources (PGDRC) funded by the French Development Agency (AFD). Until 2004, researchers at the Institute of Development Research (IRD, formerly ORSTOM) have conducted research on penaeid shrimps in collaboration with national researchers. From 2009, the research is performed only by nationals.

Finally, the Institut Pasteur of Madagascar (IPM) has an important role in the training of trainers by trainees at Home Bachelor, and Master (IH.SM, Faculty of Sciences and Polytechnic) for bacteriological analysis and control of water quality and fish products for the achievement of these studies.

Meanwhile, institutions and international NGOs working in the field of research and training in marine and coastal environment that we will describe later.

#### 2.4. Selected NGOs –

##### 2.4.1. World Conservation Society (WCS)

WCS is an international organization which was founded American Apr. 26, 1895. She was known as New York Zoological Society. Its mission is to conserve, sustainably manage wildlife and flora as well as extensive natural and develop research on biodiversity. Currently, it manages more than 300 conservation projects in over 50 countries worldwide. She has worked in Africa since 1956, and in Madagascar since 1993 and whose activities and areas of intervention are in Antsiranana, Mahajanga, Toamasina and Toliara. She works with various partners for the application of its activities sheave (MNP for the creation of the Masoala Marine Park and Special Reserve of Nosy Mangabe, the Ministry of Water and Forests, IH.SM, and the local community).

**Comment [MAKN5]:** HOW ABOUT WIOMSA, WWF, IUCN ECO AFRICA ETC

To get a better result, WCS conducts training activities at various levels including the content and modalities of implementation vary according to target groups. Thus, training affect the following categories:

Level students :

- Coaching and support for students as part of dissertation study of DEA and Ph.D. (2étudiants/cycle / year boxes);
- Short internship 1-2 months: training on specific technical skills (workshop logistical support, file management, retrieval on the web ...)

Supervision of University Teachers by :

- exchanges on methods of teaching and assessment
- documentary support
- the allocation of teaching tools
- specific themes on the conservation of biodiversity

Training of technicians (partners) on specific issues on the conservation of biodiversity and sustainable management and on demand of target groups:

- Basic knowledge on the Conservation of Biodiversity
- Managing threatened species
- Management of Protected Areas
- Sustainable management of natural resources
- Climate Change
- Ecological Restoration

Each course includes a presentation of scientific evidence related to the theme and guidance on the use of tools (eg GIS techniques for threat assessment, development plan), together with an application on the ground.

Basic Training Communities (COBA) on topics specific to the conservation of biodiversity (at the request of targets)

- Basic knowledge on the conservation of biodiversity
- Managing threatened species
- Management of Protected Areas
- Sustainable management of natural resources
- Climate change:
- Ecological Restoration

Training is done in a workshop format by allocation of teaching materials adapted to local contexts and in the Malagasy language.

Training internal staff of WCS in Madagascar (occasionally) through the strengthening of technical capacity in the field of biodiversity conservation primarily through allocation of educational tools, and training workshop (occasionally)

#### Other enhancements skills for partners

WCS also conducts training sessions for leaders building capacity within partner organizations (technical Drest SAS and SAT + MNP + staff NGOs) in the form of training workshops whose content is based on the following topics: Engineering Training (simplified), Andragogy, active learning approach, active learning techniques and presentation skills, communication techniques and interpretation and evaluation techniques.

#### 2.4.2. Educators and Professionals Network of Conservation (REPC)

In most countries, the lack of educational resources and training is the main obstacle to building a reliable tool for the protection of biodiversity. To remedy this problem, the Center for Biodiversity and Conservation (CBC) American Museum of Natural History (AMNH) and its partners have developed a network of professional educators and conservation (REPC). This last is an international effort to design, create and encourage the creation of a set of educational materials promoting the protection of biodiversity. He works primarily with university teachers and trainers working in conservation bodies. REPC is to bring together professionals working in the field of biodiversity conservation with educators to create and make available to teachers and instructors a variety of resources (modules) for teaching the conservation of biodiversity, develop networks and resource centers around the world to provide more training opportunities on the conservation of biodiversity.

In Madagascar, The activities of REPC began in January 2004. Currently, more than 50 institutions including universities, public and private institutions, and conservation NGOs throughout the country have joined the network.

To improve the practice of biodiversity conservation in Madagascar, members of REPC act at two levels:

- in academia: improved training, by varying the following courses professional needs and incorporating the human, economic, legal and socio-political;
- in the workplace: building knowledge technicians in legal instruments of planning and implementation of management policies, environmental project management and technical management of biodiversity.

One purpose of the activities is the creation of ERCP these modules have been used in classrooms since 2006 to be integrated gradually into existing curricula. To date, 30 modules have been well developed in collaboration with teachers and local conservation professionals who are on the following topics:

- Importance of Biodiversity
- General information on the threats to biodiversity
- Loss and fragmentation of ecosystems
- Characteristics of threatened species
- Tools for prioritization of areas important for conservation

- International Treaties for the conservation and management of the sea
- Marine Science
- Shipping Policy
- Integrated Coastal
- Marine protected areas and protected area systems
- Geographic Information System
- Climate change: issues, impacts and adaptive solutions.

#### 2.4.3. NGOs Frontier Madagascar

Frontier is a collaboration between IH.SM and Environmental Exploration Society (Society for Environmental Exploration or EES). It is installed in Toliara 1999 by launching a marine project based Anakao Toliara. In 2001, the project was created land that has been done in collaboration with WWF to set up an area in the forest protects Mikea, Southern Region. From 2005, he broadened his field investigations in the northern region, particularly in Antsiranana where it joins with the University of Antsiranana and SAGE.

Frontier aims to conserve biodiversity and ecosystem integrity. This goal is achieved through a myriad of global projects working for:

- monitor levels of biodiversity;
- conduct environmental studies to provide baseline data for biodiversity (habitats and resources) to give the arguments for protection;
- integrate communities in conservation initiatives;
- form of international volunteers and local professionals to develop their particular skills in the field of biodiversity conservation.

Frontier works with volunteers who come mainly from Great Britain.

#### 2.4.4. Blue Ventures

Blue Ventures is an international NGO concerned with conservation of the marine environment. Its mission is to provide a program of research, training, and information on marine conservation. She is also involved in education and awareness of the village community for the safeguarding and protection of the marine environment. The research results are applied directly to the sustainable management of marine resources. Blue Venture began working in Madagascar since 2003. Its area of action is in the area of Andavadoaka located north of Toliara. The area is rich in Andavadoaka varied resources and ecosystems because it is endowed with beautiful beaches, reef complexes and some islets are villages and/or fishing grounds for fishermen. Blue Ventures is partnering with IH.SM, WCS, ANGAP, the COPEFRITO, and Compagnie Maritime 22nd parallel (fishing community whose mission is to develop fisheries) to expand its activities.

Among the achievements of Blue Venturse in the field of conservation include:

- Creation of spinning reserve or "no take zone" in Nosy Fasy (3 km<sup>2</sup> which includes the fringing reefs and a large area of current) for the sustainable management of octopus;
- The establishment of a marine reserve called Velondriake "(translated literally" to live with the sea) in partnership with a dozen fishing villages. This reserve will benefit more than

10,000 personnes and protect coral reefs, sea grass beds of seagrass, mangroves and other habitats. Local communities are trained in science and conservation planning, and a board of directors was established to oversee the implementation, management and monitoring of conservation.

With traditional conservation, strategies Seasonal 'no take zone "and the permanent reserves, villagers living around Velondriake will benefit a variety of sustainable development activities created by Blue Ventures, including raising sea cucumber , algae culture and eco-tourism

To increase national capacity in the field of conservation Blue Ventures is also conducting a variety of training programs on environmental issues at various levels. Each year, it awards a national scholarship for 18 Malagasy students from universities for a course of six weeks of comprehensive training for marine research, science and conservation. Workshops on conservation are undertaken regularly with ANGAP to train officials and local communities with activities related to resource conservation.

Since diving is a discipline rare in Madagascar, Blue ventures as local villagers and students to have a diving certification. More than a dozen villagers have received their certificate. To cultivate a new generation of conservationists s Madagascar Blue Venture has created the Environmental Club for children aloalo Andavadoaka.

All activities are based on Blue Ventures scientific research. Working with local and international partners, the scientific study Blue Venture increasing threats to coastal areas, changes in the health of habitat, impacts of conservation efforts by integrating traditional knowledge. Research results will dash for conservation strategies to be adopted.

Among the most notable success of Blue Venture, include:

- In 2007, the village association Velondriake Andavadoaka with Blue Ventures was awarded the Equator UNDP biodiversity conservation and the reward WWF J. Paul Getty Conservation conduct;
- Velondriake replica model for creating marine protected areas in 50 other locations in Madagascar, even in other sectors in the Indian Ocean;
- Creating sustainable aquaculture initiatives in Madagascar by the development of the first commercial-scale farms of sea cucumbers in the Indian Ocean providing alternate sources of income for communities.
- Fellowships and training in marine conservation to more than 50 students at Master and PhD

#### 2.4.5. Reef Doctor

The Reef Doctor is a British organization working in the conservation of coral reefs. Its area of action is Ifaty at which he was able to establish (i) a small museum intended largely for the villagers, and (ii) a marine reserve called "The Garden of Roses" to keep some reef areas in this region.

In addition to conservation activities, Reef Doctor also carries out research in marine and managers share their knowledge through scientific leadership in Malagasy researchers Masters and DEA.

#### 2.4.6. The deficiencies in training and research in marine environment

At the training, we found the following facts:

- Inadequate supply and demand: Training System not dictated by the application:
  - (i) lack of a mechanism of exchange with business and expression of training needs;
  - ii) non-professional involvement in program development and implementation of training;
  - (iii) current channels are not adapted to economic realities: inadequate learning conditions, lack of agricultural establishments in rural areas
- Of course curricula and lack of relevance:
  - i) training-of-date and not complying with the requirements of the workplace ;
  - ii) a fuzzy articulation between basic education, secondary education, higher education and vocational and technical ;
  - iii) duration of training two to three years for initial ;
  - iv) conditions for implementation of inadequate training: equipment and inadequate training materials, trainers lacking professional qualifications, lack of textbooks.
- Mechanism of quality assurance does not exist: Low internal efficiency (repetition rate and dropout rate).

On research, analysis of the situation but is focused on the following points. Most of the capital is concentrated in three cities (Antananarivo: CNRE; Toliara: IH.SM and Nosy Be: CNRO which is currently in recovery phase after traveling a difficult time). The virtual lack common rolling stock and air crew and ground equipment, the difficulties of communication (roads) contribute to the overall lack of compliance activities on land and the concentration in coastal areas close to settlements of these organizations (including Northwest coast and Southwest).

In all institutions, the investment budget and the general operating budget is woefully inadequate. The expenditure necessary for the execution of research programs come largely from foreign aid (see Table 2 for the case of IH.SM). The state has no national policy for research in marine sciences.

Among other things, lack of information systems and collaboration between various agencies engaged in research on coastal and marine environment and the multiplicity of political action rarely concur that work in this area are both disparate and partial fall short of actual knowledge resources throughout the island, despite the high number of projects already completed. There, often duplicates in the actions of these organizations. In addition, each institution has a tendency to consider the results of work or research as of achievements. They



should nevertheless be widely disseminated to policy makers, operators or service providers take this into account.

Faced with these problems, a better organization of research programs on marine and coastal environment is expected to rise above all the creation of a National Coordinating Committee whose role is to guide the priority themes to produce, manage and disseminate all the results of research.

Overall, researchers have substantial training in basic scientific methods. However, before the evolution of technology, it would take an occasional refresher to improve their knowledge.

The renewable resource economy, economics and sociology of traditional structures, treatment of satellite imagery and the ecosystem approach to coastal sea level and suffering from a lack of specialists. Reinforcements of competence in these specialties will be allowed in the future.

## 2.5. THE PROJECTS UNDER THE MINISTRY OF ENVIRONMENT

Environmental policy is based on the Malagasy Environment Charter adopted in 1990, which sets the general framework. It is implemented through the National Environmental Action Programme (PNAE), declined between 1991 and 2007 in three successive phases of five years (Environment Programme (PE) 1, 2 and 3). The PNAE is controlled by the National Environment Board (PNE), supervised by the Ministry of the Environment since the creation of the latter.

In connection with the execution of the 2<sup>nd</sup> phase of the PNAE, Madagascar has established a national ICZM managed in close coordination between the cell Marine and Coastal Environment (EMC) and the Working Group and Reflection (GTR). This program also benefits from the experience and activities of other executive agencies or components of the PNAE, particularly AGERAS, GELOSE, EIS, MECIE, ANGAP. This program is over, supported by many local and regional initiatives which enable the country to have recent experience of the principles of ICZM. As examples include local projects at the local level Foulpointe, Mananara Nord, Masoala, Nosy Be, Toliara and which are good examples of ICZM in M / car.

Among other things, the first two phases of the PNAE (PE1 and PE2) saw the establishment of national institutions specialized in areas such as ANGAP in protected area management, ANAE in development activities, SAGE in participatory planning and approach to management transfer, the ONE in Environmental Impact Studies and Policy Development. In addition, other agencies have received a very strong capacity building (CFSIGE, DGDSF).

Thus, in the context of the implementation of PNAE, various capacity enhancements were made, mostly from the Phase 2 Environmental Program (or PE2) which was created during the marine component. The reinforcement of capacity has affected the following aspects:

- Training in Integrated Coastal Management (ICZM )
- Organization of local grassroots communities and structures of consultation and inter-communal levels;
- Geographic Information System (GIS);
- Study of Environmental Impacts and MECIE;
- Management of hydrocarbon pollution.

## 2.6. FISHING INDUSTRIES

In the fisheries sector: The industrial fishing companies such as SOMAPECHE the REFRIGEPECHE, artisanal fishing companies have organized training sessions for their executives and employees whose training subjects focus on aquaculture and quality control products. Training on product quality are of relatively short duration (1 week to 15 days depending on the target) and were financed by international agencies (FAO/DANIDA, UNDP / FAO) and national institutions (National Center for Technical and Vocational Training or CNFTP Agency and Regional Interprofessional Education (ARIF) and executed by the IH.SM

By cons, those in aquaculture, especially shrimp, lasted six months and have been requested by companies Malagasy shrimp (AQUALMA and AQUAMEN).

## 2.7. THE REGIONAL AND INTERNATIONAL PROGRAMS

### 2.7.1. Regional Environmental Program-Indian Ocean Commission (IOC-PRE)

At the regional level, reinforcement of skills were performed under PRE-IOC from 1995 to 2000 in the field of marine ecotoxicology by preventing poisoning by consumption of Marine Animals (ICAM) and the harmonization of monitoring the health of coral reefs. National experts trained under this project have shared their knowledge at the national level training institutions and/or search through memory training period of study or follow-up (Maharavo, 2009 ).

### 2.7.2 Regional programs: FAO SWIOFP, WIOLAB, IODE / IGOOS, ASCLME,

Various regional provide their support in building capacity in the marine field, among which may include FAO, SWIOFP, WIOLAB, IODE, ASCLME etc. ....

The training courses organized and financed by these projects both fisheries (SWIOFP, FAO), the marine and coastal environment and pollution (UNEP, WIOLAB, ASCLME), as remote sensing and GIS are taught in English. It is thus difficult to find candidates who not only meet the profile required in the proposed areas, but especially those who understand and speak English. In fact, Madagascar is a country where speaking French is the language of instruction from primary to higher education, English has been taught that from the class of 6<sup>th</sup> and again, it is an optional module. To remedy this problem, we should look ahead to organize the training session in French.

## 3. NATIONAL NEEDS AND ABILITIES REQUIRED

### 3.1. CURRENT STATUS OF SECTOR FISHERIES / AQUACULTURE AND MARINE ENVIRONMENT IN MADAGASCAR

#### 3.1.1. Fishing and Aquaculture Sector

The Master Plan for Fisheries and Aquaculture, established in 1992 and updated in 2004 to 2007 (Andrianaivojaona and al, 1992; Andrianaivojaona and Kasprzyk, 2003; Andrianaivojaona et al, 2004; Anonymous, 2004a) provides guidance for sector development. The main objectives can be linked to an increased consumption of local fish, diversifying export products and create jobs. The revision of this plan, taking into account the achievements and new targets in terms of national economic policy, has set itself the main perspectives for the period 1997-2007 (i) increased foreign exchange earnings, (ii) participation in meeting food needs, (iii) the participation in the fight against poverty, (iv) and the preservation of natural resources for sustainable development. The fundamental objective is to ensure sustainable development activities, avoiding resource depletion and environmental degradation. The implementation of this plan rests on three main strategic thrusts which are:

- ✓ development of production and services for export;
- ✓ improving sector management (including improved resources, systems development and protection of the marine environment and coastal);
- ✓ the increasing collection and marketing of products for local consumption.

As regards the guidelines for human resources, we can say that level of administration, the primary concern relates to the responsibility of managers and technicians who are active mostly in retirement by starting 2 years, and establishment of a framework at both central (design, control, monitoring) and regional (technical assistance, statistical control) for a more efficient management of the sector. For example, for 1997, the recruitment needs totaled 80 including 45 executives technician.

In the private sector level, the general concern reflects a desire to meet the requirements of national and especially international markets. Thus, like most of the technical staff has not received initial training on the subject, and that training on the job offered by companies has not yielded the expected results, the technical staff retraining is a way determined to achieve a level of expertise. In other words, firms do not provide long-term hiring technicians (managers and / or agents) and graduates who have received specialized training, except in new activities such as shrimp farming and sea cucumbers. The embargo against the Malagasy fishery products, the EU has been the trigger raising awareness to some officials of fishing companies in the need for skilled, trained and have a good knowledge base.

#### 3.1.2. Environment Sector in Madagascar

With its rich and unique biodiversity, Madagascar has demonstrated an awareness, not to mention the conventions ratified internationally, the establishment in 1990 of an environmental charter which has purpose of reconciling man with its surroundings. It is in this context that defined the legal framework for the implementation of the National Environmental Action Plan (PNAE). The latter, having started in 1991, is implemented under the leadership of the World Bank. In Madagascar, it is a large program funded by several donors (World Bank, International

Monetary Fund, UNDP, WWF, Conservation International) for a period of 15 years and divided into three phases of five years each that are the Environmental Programs: PE1 (1991-1996), the PE2 (1997-2001) and PE3 (2002-2007).

This program is implemented by the National Office for the Environment (ONE) under the supervision of the Ministry of Environment. Its general objectives of conserving and managing heritage of biological diversity, promote sustainable development through better management of natural resources, improve living conditions in rural and urban areas, and develop human and institutional capacities. By cons, all three programs has its own objectives.

- o Thus, PE1 he had set the goal of improving the management capacity of the environment through the implementation of urgent actions (changes to existing texts, improving existing tools including protected areas) and institutional development that ONE. The first program consists of seven thematic components: (a) protection and management of biodiversity and threatened ecosystems in an integrated approach, (2) soil conservation, agroforestry, reforestation and other rural development activities in priority areas of program, (3) mapping and progressive implementation of a geographic information system, (4) demarcation of protected areas and improving security of land rights, (5) environmental research on terrestrial, coastal and marine (6) supporting activities: institutional strengthening, development of a regulatory framework and environmental assessment processes, enhancing the environmental database, monitoring and evaluation, and study of sectoral policies, (7) education, training and Environmental Awareness.

- o The PE2 is a perspective of increased activity initiated from the PE1. It has set targets to increase the sustainable use of natural resources, including soil, forest cover and biodiversity in sensitive areas And set out the conditions for a sustainable management of natural resources and environment at national level. It is divided into 14 components, thematic or cross (with other departments), working as sub-programs coordinated by ONE. Can be found in Appendix 1 the different components of PE2, each of which is controlled by an Executing Agency. Note that the ONE, who oversees all of the PNAE is also an executing agency for certain specific components, such as component Marine and Coastal Environment (EMC).

For activities relating to coastal management, evaluation of PE1 has to include a specific program on this subject in the PE2. Related actions are supported by the component Marine and Coastal Environment (EMC). To implement this program, representatives of major institutional actors (ministries, donors) and various government agencies, scientific and socio concerned with coastal and marine, have worked together to form the Working Group and Reflection (GTR). This is a cross-sectoral structure of national consensus, was responsible for preparing the path to defining and adopting a national policy for sustainable development of coastal areas. There are two levels of GTR : the GTR at the national and regional level GTR.

- o The PE3 is intended to contribute to sustainable conservation and exploitation of natural resources to ensure sustainable economic growth and improved quality of life. The specific objectives are defined as methods of management of natural resources and

biodiversity conservation are adopted by the people and sustainability at the national level management of natural resources and environment is assured.

Parallel to this, Madagascar began in 2003, as part of the Durban Vision (MAP, 2006), to triple the protected areas both terrestrial and marine. The realization of this commitment requires the existence of qualified and specialized in conducting research for the establishment of protected areas, especially in management itself. The majority of managers and technicians working in the conservation of the marine environment are biologists graduates of Faculties of Science or Agronomy chain, and have not received specific training techniques and in the marine realm. With the multiplicity of international organizations (WWF, CI, WCS) and various NGOs, both national and international working in the conservation of the marine environment, it is necessary to intensify training on Marine Science to offer these institutions of skilled managers and technicians.

### 3.2. GUIDELINES SECTORS IN HUMAN RESOURCES

In Madagascar, the people working in the marine area (fishing, aquaculture, marine environment) can be classified into different categories:

- Senior;
- Senior technicians and technical assistants
- Officials in the devolved institutions (Fokontany, Town, Region)
- Population.

Thus, training needs will affect different categories of persons mentioned above depending on the positions they occupy:

- higher education level (i) universities for future executives for some design or deliver programs in different departments (fisheries, environment, water, forest, etc ... ..)
- (ii) senior technicians specialize in the fisheries, aquaculture, control of quality, conservation, wastewater treatment or other (eg collectors);
- Short Courses for (i) the various officials in the field of decentralized governance
- (ii) and the rural population in the acquisition of environmental reflex

The topics covered by each course are as follows:

At university level:

- o Training Executives (at universities):
  - Fisheries Science
  - Oceanography
  - Economy and Socio-economics
  - Expert Digital (statistics, applied mathematics)
  - Data management and information management skills
  - Training in English
  - Aquaculture
  - Coastal Zone Management
  - Ecosystem approach
  - Legislation and International Conventions

- o At the level of technicians:
  - Training of inspectors and observers
  - Fishing Technology, Quality Control
  - Monitoring the environment, including pollution and telemetry
  - Remote sensing and GIS
  - Taxonomy and Selection
  - Surface and Marine Pollution
  - Assessment of environmental impact

Short Courses:

- o Decentralized level officials
  - Expert Witness
  - Governance
  - Training managers transdisciplinary

- o At the population level
  - Environmental Education

#### 4. TRAINING NEEDS BY THE DELIVERABLES OF MEDA

Among the priority topics to be proposed by the needs expressed in the MEDA are:

- Ecosystem Approach
- Remote sensing and GIS
- Enhanced ICAM
- Integration of traditional knowledge in resource management
- Data Management
- Taxonomy (lack of taxonomic specialists to M / car, (see Paris MNH) for academics
- Governance
- Capacity building on pollution and wastewater treatment (the number of officials who have been trained is limited, and in case of job assignment, there is no respite).

#### 5. LINKS AND REGIONAL AND INTERNATIONAL SUPPORT

Generally, in all departments guardianship or those having a direct relationship with the marine environment, the capital budget and operating budget are notoriously inadequate. In addition to salary expenditures are fixed costs, those required for the execution of training programs and research or from external aid. The main lines of applied research and development studies are largely supported by foreign countries and regional projects and international as:

- Management of industrial fisheries (SWIOFP);
- Environmental projects: Marine and Coastal Environment Program of PE2 (GEF/UNDP/World Bank/WWF / France/USAID), the pollution component (WIO-LaB/UNEP)

- The conservation program and creation of protected areas (KfW / Germany, CARE International, WWF, WCS, UNDP, World Bank
- Program phase II regional tuna (AT / IOC)
- Monitoring and control of fisheries (EFD, HRD)
- The study of stocks: lobsters and sea cucumbers (World Bank) octopus (PROGECO) shrimp (CFD, ORSTOM, GAPCM) - aquaculture: red algae (EFD), assistance in aquaculture shrimp (Japanese Government);
- Development projects: Fisheries Sector Programme (UNDP/FAO), development plan of prawn fishing (CFD) study biological and socio-economic and traditional fishing craft (CIDA), quality control of fishery products ( EFD); development of artisanal fisheries in Nosy Be (GTZ),.

For example, Table 8 presented in paragraph 2.2.1.2. major regional and international projects working in cooperation with the IHSM in training and research on the marine environment.

## 6. DRAFT PROPOSED FORMATION OF STARTING

### 6.1. CONTEXT

At Madagascar, The IH.SM from the University of Toliara is the only educational institution specializing in full training (biology, ecology, ethology, social and economic resource in fisheries and aquaculture and their management) in Marine Science and Halieutique. In addition, national and international call, generally, to IH. SM for occasional trainings focus, particularly in capacity building of staff and training of local basic materials of marine environment and marine resources management. Besides the training, IH. SM realizes, too, research in marine and coastal environment. In addition, some departments of other universities Madagascar (Antananarivo, Mahajanga, Toamasina, Fianarantsoa ) Teach specific modules related to the marine environment. Currently, the Malagasy universities prepare their entry into the BMD system. Given the structure of training and the expertise available in marine science and fisheries at the IH. SM, it would logically established Graduate School (ED) in those specialties that gravitate around the departments of other universities teaching modules that complement those of IH. SM and will be considered as institutions host. The national research centers will also, host institutions where the trainees can apply and refine their knowledge.

This system aims to provide better readability of qualifications in the labor market, given the openness and integration of Madagascar in various international and regional organizations. In this vast country called Madagascar but also in the region (Indian Ocean and East Africa), it encourages the mobility of teachers and students, and helps provide a uniform training and level recognized in these fields to a greater number of students and staff of organizations and institutions working in marine and coastal environment, localized in different regions of Madagascar. Indeed, given the results of inventory of training needs in Integrated Coastal Zone Management (ICZM) established under ReCoMaP in July/August 2009, there are already more than fifty applications spread across several regions of Madagascar . On the other hand, knowledge of marine and coastal and marine resources are still weak national from the results of MEDA (Bemiasa J., 2009, Cooke, 2009; Rakotondralambo and Ranaivomanana, 2009; Ranaivoson, 2009) because only the coastal and marine areas of South-West and North-West

Madagascar's most widely studied through the work of IH.SM at Toliara and National Center for Oceanographic Research (CNRO) at Nosy Be.

## 6.2. TRAINING PRIORITY

In this context, the proposed training project will be based mainly at the two institutions (IH.SM & CNRO) that already respond to external calls for information in areas where Madagascar lacks specialists (taxonomy, marine pollution, legislation and international conventions, police control and monitoring (MCS)). The training project will be prepared by the IH.SM, a national focal point who will coordinate and distribute the activities between and among different host institutions, in terms of fields of training, the spatial and temporal teaching staff (local, national, field trips).

Training is aimed at three (3) levels:

- Level 1: Researchers at Masters, Masters or Ingéniorat (“state engineer”)
- Level 2: Technicians or Bachelor Degree level
- Level 3: Technical Officers below the Baccalaureate level.

In order that candidates in training have good baseline general knowledge about the marine and coastal ecosystems and environmental sciences, lessons in these subjects will be provided for all, according to their respective educational levels, before undertaking their more specialised discipline-specific training.

Although the implementation of the BMD system will take some time (initial implementation is planned for early 2012) before its final establishment at the IH.SM and reception facilities, all training needs, input, meeting the needs of the system so that the diploma or certificate that the sanction level is valid needs to take place. That is why a training plan will be developed according to current priorities.

Given the training needs expressed, and institutions currently selected, teaching units can be grouped into several themes consisting of several modules or units.

### 6.2 .1. Basic Education Units

Marine Biology and Ecology (marine biology, marine ecology, knowledge of the fauna, the flora and marine and coastal ecosystems, knowledge of marine and coastal biodiversity) will be provided as basic training for all candidates, in the Module General and Environmental Science. They will be offered to the highest level (level 1) at IH.SM, and levels 2 and 3 (technicians and technical officers) will be offered at the UFP Mahajanga with support (if needed) by lecturers from IH.SM.

### 6.2.2. Units of specific educational priority

These units will be created at IH.SM or in institutions at other specialized universities.

**Comment [JRS6]:** This should probably be more targeted at PhD, MSc and BSc levels, with technicians having BSc, very junior researchers MSc and more senior researchers having PhD. However, being based on French educational systems, this may be a bit different. I am not familiar enough to resolve this.

**Comment [JRS7]:** (BMD) Bachelors – Masters – Doctorate aka LMD – License, Master, Doctorate see <http://www.univ-larochelle.fr/The-3-cycle-degree-structure> or [http://www.smeno.com/etudiants/1519\\_lmd-system.html](http://www.smeno.com/etudiants/1519_lmd-system.html)



- Management and Integrated Coastal Zone Management (ICZM, coastal management and marine, sustainable management of coastal and marine natural resources, design and implementation of the concept of "Integrated Development" pursuant to ICZM in the development of common and regional [goals?], conflict management, establishment and management of MPAs);
- Evaluation of significant social, environmental and climate change and ecological patterns focusing on marine and coastal ecosystems (ecological monitoring of coastal ecosystems, social and environmental assessment of investments in coastal areas, EIA, SEA);
- Geographic Information System and management of databases (GIS, spatial [data] and use of databases in GIS mapping);
- Technical education and familiarization with suitable communication tools at all levels (grassroots, policy makers, politicians, heads of various central and decentralized [institutions]);
- Ecotourism and Sustainable Tourism (Ecotourism, Sustainable ecotourism, Tourism development planning and Ecotourism in the marine and coastal environment);
- Exploitation of Marine Resources (Processing of marine fisheries resources and coastal resources);
- Marine and coastal pollution (domestic waste management, marine pollution and industrial pollution; Degradation of the marine environment; Oil pollution of the marine and coastal environment);
- Laws and international conventions including MCS.

### 6.2.3. [Advanced] Teaching Units

These units require a longer training period because they relate to advanced themes and studies. They are reserved for candidates from the top level (Level 1) and whose subsequent activities will provide information for the enrichment of MEDA. These are mainly:

- Biological Oceanography, with evaluation and management of stocks of marine resources, including fisheries management and fisheries economics,
- Physical Oceanography including the study of waves, waves and ocean currents, and predictive models of the dynamics of the sea;
- Climatology and hydrology in the coastal environment with consideration of the coastal topography, soil and marine and coastal erosion.

### 6.3. INITIAL TRAINING PLAN

Two types [streams?] of training are foreseen. One, Capacity Building, will be devoted to reinforcement of capacity by teaching specific units identified [in the capacity building assessment] after a unit of basic education. The other, Academic, will be a [more traditional] academic [tertiary?] style of training as currently taught at IH.SM, supplemented by a number of additional modules, to meet the information needs of the MEDA (Bemiasa, 2009, Cooke, 2009; Rakotondralambo and Ranaivomanana, 2009; Ranaivoson, 2009). Five (5) candidates from the inventory of ICZM training needs can participate and [their studies] will already be completed by application deadline, either through competitions organized by normally HI. DMs beginning of the academic year. These two training [streams] make up the proposed training plan.

Comment [JRS8]: No idea what this is

### 6.3.1. Capacity Building

This enhanced capacity building training will be distributed across five (5) existing institutions (IH.SM Toliara; PFU of Mahajanga; Toamasina GRENE; ISTE Fianarantsoa; Antananarivo ESPA) and meet the needs of specifically identified academic units. This allocation will allow the mobility of teachers and candidates to begin.

**Comment [JRS9]:** Not sure if this means physical mobility or some sort of information exchange/sharing. I suspect it may mean the former.

- Units of instruction on basic marine biology and ecology will be conducted for 32 candidates from level 1 at IH.SM Toliara and 17 candidates for Level 2 and 3 at the UFP Mahajanga. Respectively, it will require 80 hours of classes and six teachers mobilize IH.SM and an outside expert in taxonomy, and 50 hours of lectures and four teachers from the UFP supported by a teacher from the IH.SM specialized in maritime pollution.

A total of 49 candidates will receive this basic education. [An]other 8 will have Academic background (5) and training in laws and international conventions (3).

**Comment [JRS10]:** Not clear, this is the best I can do.

- Units of specific teaching

The specific units of instruction include:

- Integrated Coastal Zone Management (ICZM)
- Geographic Information System (GIS)
- Systems Advocacy and Communications (SSC)
- Ecotourism and Sustainable Tourism (TED)
- Laws and Conventions on Maritime Area (LCEM).

The overall content of these specific units of instruction, the distribution of candidates, terms of education and the number of teachers required are compiled in Table 13.

**Comment [JRS11]:** Syllabi?

ICZM and GIS Units for 32 candidates [at level 1] will be conducted entirely at IH.SM Toliara. They will be followed by the Computer Systems Awareness and Communication (SSC) for 6 candidates.

The GIS unit for 17 candidates at levels 2 and 3 will be conducted entirely at GRENE Toamasina. It will be followed by 7 candidates undertaking the SSC unit. The 17 candidates trained in basic education at Toamasina will then be transferred to to the UFP Mahajanga.

The Sustainable Tourism Unit and Ecotourism (EDP) will be conducted at the ISTE Fianarantsoa. The 10 candidates trained at Level 1 and ICAM GIS at IH.SM will be transferred to Fianarantsoa. A specialist marine teacher from the IH.SM will support training at ISTE.

The Laws and Conventions on Maritime Area (LCEM) unit will be conducted at the Antananarivo ESPA - 3 candidates at Level 1. An international or regional expert will support the ESPA training.

Table 13: Distribution of lessons and candidates

Units of instruction/	Training	Level	Number	Origin of	Hours	Number of
-----------------------	----------	-------	--------	-----------	-------	-----------

Modules or themes	Institution	of candidate	of candidates	Candidates		lecturers
<b>UNIT OF BASIC EDUCATION</b>						
<input type="checkbox"/> Education Unit Basic Level 1  - Environmental Sciences - Oceanography  - Marine Biology (Biodiversity, fauna and flora, taxonomy and selection)  - Marine Ecology (major ecosystems, structure and operation, pollution)	IH.SM / Toliara	1	32	Antananarivo: 9 Nosy Be: 11 Toamasina: 9 Antsiranana: 2 Toliara: 1	During 30H courses 50H TD  During 10H courses 10H TD  During 10H courses 20H TD  During 10H courses 20H TD	6, including outdoor  1 Oceanographer  3. 1 Fauna, 1 Flora 1 Exterior  2. 1 Ecology 1 Pollution
<input type="checkbox"/> Basic Education Unit, Level 2 and 3  - Environmental Sciences  - Marine Biology (Biodiversity, fauna and flora, taxonomy and selection)  - Marine Ecology (Ecosystems, structure and operation, pollution)	UFP / Mahajanga	2 and 3	17	Nosy Be: 9 Toamasina: 8	During 15H courses 35H TD  5H courses 10H TD  5H courses 15H TD  5H courses 10H TD	5:  1 Oceanographer  2. 1 Fauna 1 Flora  2. 1 Ecology 1 Pollution (IH.SM)
<b>SPECIAL EDUCATION UNITS</b>						

Comment [JRS13]: ?fieldwork? External expert?

Comment [JRS12]: Not sure what TD is.

Comment [JRS14]: Expert/Consultant?

<input type="checkbox"/> Units of specific teaching  - Geographic Information System (GIS) and Ecological Methods Followed Level 1 <input type="checkbox"/> Research and data storage <input type="checkbox"/> Handling cards FTM, Google and aerial photos <input type="checkbox"/> Introduction to GIS and database management  <input type="checkbox"/> Spatial data and their use for follow-ups	IH.SM / Toliara	1	32 (3groupes )	Nosy Be: 9 Toamasina: 8	During 15H courses 40H TD  5H TD 10H TD  5H courses 20H TD  5H course 10H TD	2.   1  1  -   -
- Geographic Information System (GIS)  ❖ Introduction to GIS and database management  <input type="checkbox"/> Manipulating maps and data for specialization followed	GRENE / Toamasina	2 and 3	17 (2groupes )	Nosy Be : 9 Toamasina: 8	During 10H 20H TD  5H courses 10H TD  5H courses 10H TD	1   -   -  -   -
- Advocacy and Communications Systems (CCS) level 1  ❖ Environmental Education	IH.SM / Toliara	1	6	Toamasina: 2 Nosy Be: 3 Antsiranana: 1	During 10H 35H TD  5H courses / TD	1   -   -

Comment [JRS15]: This may be maps or charts.

Comment [JRS16]: Not sure, may be French acronym?

<ul style="list-style-type: none"> <li>❖ ICAM Concept</li> <li>❖ IEC Technical</li> <li>□ Establishing protocols broadcast /communication information</li> </ul>					5H courses / TD  15H TD  20H TD	-   -  -   -  -   -
<ul style="list-style-type: none"> <li>- Advocacy and Communications Systems (CCS) levels 2 and 3</li> <li>❖ Environmental Education</li> <li>□ IEC techniques and their applications</li> </ul>	GRENE / Toamasina	2 and 3	7	Nosy Be: 4 Toamasina: 3	5H courses 10H TD  5H courses / TD  10H TD	1
<ul style="list-style-type: none"> <li>- Ecotourism and Sustainable Tourism (TED)</li> <li>❖ Socio-cultural</li> <li>❖ Ecotourism Development Community</li> <li>❖ Sustainable management of tourism and ecotourism (manageme</li> </ul>	ISTE / Fianarantsoa	1	10	Antananarivo: 6 Toamasina: 2 Nosy Be: 1 Toliara: 1	During 20H 45H TD  10H  10H TD  5H courses 15H TD	3 with 1 IH. SM  1  -   -  1

nt, planning, marketing)  □ Impact assessment and evaluation of social investment in coastal areas					5H courses 20H TD	1 IH.SM
- Integrated Coastal Zone Management (ICZM)  ❖ Concept and definitions  ❖ Sustainable management of natural resources  □ Exploitation of marine resources (technology of production, conservation and processing; aquaculture technology, quality control)  ❖ Coastal zone management and marine  ❖ Marine and coastal pollution (domestic waste, industrial	IH.SM Toliara	1	32	ntananarivo: 9 Nosy Be: 11 Toamasina: 9 Antsiranana: 2 Toliara: 1	During 25H 105H TD  5H courses TD 5H  10H TD  10H courses 40H TD  20H TD  5H courses 15H TD	4  1  - -  2  1  - -

<p>pollution by oil)</p> <p>❖ Marine Protected Areas (creation and management)</p> <p>☐ Conflict Management</p>					<p>5H courses 10H TD</p> <p>5H TD</p>	1
<p>- Laws and Conventions on Maritime Area (LCEM)</p> <p>☐ National legislation and international</p> <p>❖ Regional and international conventions</p> <p>❖ Procedures and applications</p> <p>☐ Police Sea</p>	ESPA / Antananarivo	1	3	Antananarivo: 3	<p>During 10H 30H TD 9H conferences</p> <p>5H courses 3H lectures</p> <p>5H courses 3H lectures</p> <p>15H TD</p> <p>15H TD</p> <p>3H lectures</p>	<p>2 with 1 outside</p> <p>2</p> <p>-   -</p> <p>-   -</p> <p>-   -</p> <p>-   -</p>

**Comment [JRS17]:** Expert/consultant – presumably “outside” meaning foreign?

After this enhanced capacity, applicants will receive a certificate for the specific units of instruction passed. The assessments are conducted six (6) months after the end of training, at their home institutions by groups of lecturers in schools to ensure effective implementation of the educational units provided.

### 6.3.2. Academic

This training will consist of credits required. Level 1 candidates will be finished after their training with a Master's degree in Oceanography, with two specialized applied: Sustainable management of coastal and marine ecosystems. Training will be provided at the Graduate School IH.SM in Toliara.

The credits are :

- Operational Oceanography
  - Waves, waves, currents and marine coastal geomorphology,
  - Physical oceanography, chemical, geological and geophysical
  - Ecosystems and pollution,
  - Climatology and hydrology in coastal zone and impacts of climate change,
  - Models of dynamic monitoring of sea and oceans and coastal areas.
  
- Fisheries
  - Stock assessment and population dynamics,
  - Fisheries management by ecosystem approach,
  - Technology, fishery gear selectivity, their impacts and improvements,
  - Economics of fisheries.
  
- Aquaculture
  - Systems and farming technologies,
  - Power and diseases,
  - Environmental impacts.
  
- Tourism
  - Socio-economic-cultural
  - Planning, management and planning of tourist attractions and ecotourism,
  - Marketing of tourism services.
  
- Governance
  - Integrated Coastal Zone Management (Concept and applications)
  - Creation and Management of Marine Protected Areas,
  - GIS techniques and their applications followed ecosystems
  - **Police Law** and the Sea: laws, conventions, procedures and applications.

**Comment [JRS18]:** This rather clumsy phrase I've replaces with MCS elsewhere above, but it may in fact simply be familiarization with relevant national legal Acts etc.

Comprised of one (1) academic year, the training ends after a period of four months in the applicant's home institutions or in enterprises or institutions working in the field of marine and coastal environment. They will be supervised by a teacher from the IH.SM and responsible institutions. After submitting **briefs**, the candidates receive their diplomas or certificates.

**Comment [JRS19]:** Some kind of report?

### 6.3.3. Summary of the training plan to start

Table 14. Summary of the plan.

Training institutions	Academic Units	Number of candidates	Number of teachers	Programme Duration
1. CAPACITY BUILDING				



IH.SM / Toliara	<input type="checkbox"/> Unit Basic Education Level 1 - Environmental Sciences, Oceanography General - Marine Biology - Marine Ecology	32	6 with 1 external teacher in taxonomy	80H
	<input type="checkbox"/> Units of specific teaching Level 1 - Geographic Information System and methods followed ecological	32	2	55H
	- Advocacy and communication systems - Integrated Coastal Zone	6	1	45H
		32	4	130H
S/TOTAL1		32	13	310H
UFP/Mahajanga	<input type="checkbox"/> Units Basic Education Levels 2 and 3 - Environmental Sciences - Marine Biology - Marine Ecology	17.	5 with a teacher from the IH.SM Pollution	50H
	S/TOTAL2		17.	5
GRENE/Toamasina	<input type="checkbox"/> Units of specific teaching Levels 2 and 3 - Geographic Information System - Advocacy and Communications Systems	17.	1	30H
		7	1	15H
	S/TOTAL3		17.	2.
ISTE/ Fianarantsoa	<input type="checkbox"/> Education Unit specific Level 1 - Sustainable Tourism and Ecotourism	Ten	3 including a teacher from the IH. DMs impact marine	65H
	S/TOTAL4		Ten	3.
ESPA/Antananarivo	<input type="checkbox"/> Unit specific teaching Level 1 - Laws and Conventions on maritime space	3.	2 with a guest speaker	49H
	S / TOTAL		3.	2.
TOTAL CAPACITY BUILDING		52	25	519H
<b>2. TRAINING SCHOOL</b>				
IH.SM / Toliara	<input type="checkbox"/> Credits	5 more call for applications		

	- Operational oceanography		- An oceanographer - A Physicist - Chemist 1 - A Climatologist - A Hydrologist	230h	
	- Fisheries		- 1 <b>Dynamicien</b> -1 Specialist Fishing - A Fisheries Economist, <b>exterior</b>	175H	<b>Comment [JRS20]: ?</b>
	- Aquaculture		- An Aquaculture Specialist	90H	
	- Tourism		- 1 Specialist Tourism - ICAM 1 Specialist	60H	
	- Governance		- 1 <b>Juriste</b> - An external speaker	280h	<b>Comment [JRS22]: Lawyer</b>
	- STAGE			4months	
TOTAL TRAINING SCHOOL		5 more calls for applications	11 with two teachers from <b>outside</b>	835H	<b>Comment [JRS23]: Overseas ? Or simply from outside the participating institutions, assuming such experts (perhaps consultants) exist in .mg?</b>
3.FOLLOW-ASSESSMENT		-	2	8j	

During their training, candidates will focus on topics or themes most relevant to meet the needs of MEDA.

#### 6.3.4. Estimated Cost

- Travel candidates
  - Nosy Be/Toliara: 11 candidates
  - Antananarivo/ Toliara: 9 candidates
  - Toamasina /Toliara-: 9 candidates
  - Toliara /Antsiranana-2 candidates
  - Nosy Be/Mahajanga: 9 candidates
  - Toamasina/ Mahajanga-8 Candidates

- Mahajanga/Toamasina: 17 candidates
- Toamasina/Nosy Be: 9 candidates
- Toliara/Fianarantsoa: 10 candidates
- Fianarantsoa/Toamasina : 2 candidates
- Fianarantsoa/Nosy Be: 1 candidate
- Fianarantsoa/ Antananarivo: 6 candidates
- Fianarantsoa/Toliara: 1 candidate
- Toliara/Toamasina: 7 candidates
- Toliara/Antsiranana : 2 candidates
- Toliara/Antananarivo: 3 candidates
- Toliara/ Nosy Be: 1 candidate

- Teacher Travel

- 2 outdoor
- 1 IH.SM: Toliara-Mahajanga
- 1 IH.SM: Toliara-Fianarantsoa
- 2 Monitoring and evaluation

- Diem teachers

- 2 outdoor
- 4 National (15 days)

**Comment [JRS24]:** Assume this means expat experts.

- Fees teachers

- 2 outdoor (100H)
- 24 National (1254H)

**Comment [JRS25]:** Presumably foreign or other consultants.

- Educational supplies and office supplies

- Estimated Budget

## REFERENCES

- ANDRIANAIVOJAONA C. and KASPRZYK Z., 2003: Review of diagnosis from 1996 to 2001 the fisheries sector in Madagascar. Project TCP/MAG/0170 (b), 47p + appendices.
- ANDRIANAIVOJAONA C et al, 2004: Fisheries and Aquaculture in Madagascar: Master Plan 2004-2006, 161p.
- ANONYMOUS, 1998: Monograph national biodiversity in Madagascar. Project GEF/0311/94/63. Assistance in preparing the country study on biodiversity in Madagascar. 267p + appendices.
- ANONYMOUS, 2004 (a): Fisheries and aquaculture in Madagascar. Master Plan 2004-2007. APR / FAO. Antananarivo
- ANONYMOUS, 2009: Plaque of IHSM. Technical paper. 15pages
- BEMIASA J., 2009: Analysis of diagnostic marine ecosystems in Madagascar. Theme 1 : Environmental Biophysics. ASCLME Project Report, 50p
- COOKE A., 2009: Analysis of Marine Ecosystems diagnosis in Madagascar. Theme 2 : Macrofauna. Project Report ASCLME, 108p.
- RANAIVOSON E., 2009: Analysis of Diagnostic Marine Ecosystems in Madagascar. Theme 3 : Human Environment. ASCLME Project Report, 70p.
- Rakotondralambo A. and RANAIVOMANANA L., 2009: Analysis of Marine Ecosystems diagnosis in Madagascar. Theme 4 : Planning and Management. ASCLME Project Report, 24p.
- KASPRZYK Z. Dasylyva G., N. RANDRIAMIARISOA And RALIJAONA C., 1993: Adapting the training needs of the fisheries sector (analysis and suggestions). Framework Programme for development of fisheries and aquaculture Theme N ° 37. Ministry of Livestock and Fishery Resources. 57p.
- MAP, 2006: Madagascar Action Plan 2007-2012. Strategy Paper for Sustainable Development. 112p.
- Maharavo, 2009: Biodiversity of coral reefs of Madagascar. Thesis (Habilitation research. IHSM, University of Toliara.
- MENRS, 2008: Technical and Vocational Training and Higher Education and Scientific Research. Technical Report. 13p.

RAKOTOMALALA M., 2006: Draft failover DESS Environmental Impact Study in the LMD system. Report acts of workshop on LMD: Marine environment and coastal.Toliara, 21 to 23 August 2006. 10p.

RANARIJAONA HL, 2006: Status of LMD in Mahajanga.Report acts of workshop on LMD : Marine and Coastal Environment.Toliara, 21 to 23 August 2006. 15p.

ONE, 2000. Guidance for national policy for sustainable development of coastal areas of Madagascar. 145p.

ONE, 2002a: National Action Plan for coastal and marine areas.National Office of Environment / PIIGE, Antananarivo, 16p.

ONE, 2002b. Policy development for sustainable coastal and marine Madagascar. White Paper. Office National de l'Environnement / PIIGE, Antananarivo 28p.

## APPENDIX A

### CONTACT ADDRESSES OF VARIOUS INSTITUTIONS OF EDUCATION, RESEARCH AND NATIONAL FISHING

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#### GAPCM

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#### GRENE

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#### IHSM

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261 33 02 888 05/06 261 32 07 888 05/06  
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APPENDIX 2: RESEARCHERS/TEACHERS AND ACADEMIC STAFF

Name and first name	Diplôme	Domain
A/ PERMANENT NATIONAL RESEARCHERS/TEACHERS		
Professor - RANAIVOSON Eulalie  - MARA Edouard REMANEVY	Doctorat d'Etat ès Sc. Naturelles  Habilitation à diriger des recherches	Microbiology/ Quality and Hygiene Marine resource management
Maîtres de conférences :		
MANERA Jean Yves	Doct. es-Sciences Petroleum chemistry	Marine Pollution /Hydrocarbon
MAN WAI	Doct. es-Sciences Marine	Ecology -Fishery biology/Aquaculture
RABENEVANANA	Doct. es-Sciences	Marine Microbiology - Quality ofseafood and Environnement
RALIJAONA Christian	Oceanography	Renewable Energy
RAMAMPIHERIKA Daniel	Doct. es-Sciences	Coral reef and Spirulina farming
RAVELO Vololonavalona	Oceanography	Marine Ecotoxicology
RAKOTOVAO Jean Marie	Doct. es-Sciences	Marine resource management
RAKOTOARINIVO William	Oceanography	Marine biochemistry-Toxicology
RAHERINIAINA Christian	Doct. es-Sciences	Marine spirulina farming
JARISOA Tsarahevitra	Oceanography	Aquaculture-sea cucumber
RASOLOFORINIRINA Richard	Doct. es-Sciences Oceanography	Fisheries Management/ Climate change Shrimp fishery management/Fisheries
BEMIASA John	Doct. es-Sciences	Law
RANDRIANARISOA Ylenia	Oceanography	Holothurian Farming
LAVITRA Thierry	Doct. es-Sciences	Algology and shrimp aquaculture
RANIVOARIVELO	Oceanography	Small scale fishery /Processing and seafood quality
Lantoasinoro	Doct. es-Sciences	ICZM/Fishery
RAZANOELISOA Jacqueline	Oceanography	
RANAIVOMANANA Lala	Doct. es-Sciences Oceanography Doct. es-Sciences Oceanography Doct. es-Sciences Oceanography Doct. es-Sciences Oceanography Doct Engineer Fishery	



Assistants RAKOTONIRINA Berthin Marine turtles management	Doct Engineer Fishery PhD student Oceanography PhD student Oceanography	Marine turtles management Physical Oceanography -Hydrology
<b>B/ ASSOCIATED NATIONAL RESEARCHERS</b>		
LOPE Jean Charles MAHAFINA Jamal RAVELO Vololoniaina Clémence - HAMELO Solphi Joli RASOAMAZAVA Agrippine RASOANANDRASANA Rafalimanana  RANDRIANARIVELO Norbert KOMENO Roberto RASOAMANANTO Irene RAMAHATRATRA Frédéric RASOAMANENDRIKA Faravavy MAHERIZO Tiandrainy Gedice	Doct. es-Sciences Oceanography Doct. es-Sciences Oceanography PhD student -oceanography PhD student –oceanography  PhD student -oceanography PhD student –oceanography  PhD student -oceanography PhD student –oceanography PhD student –oceanography PhD student –oceanography PhD student –oceanography PhD student –oceanography PhD student –oceanography	Planktonology Biology Shells /Coral reefs Water science Environmental Engineering  Algology -Bacteriology-Pesticides  Marine mammals Ecotoxicology/Marine Pollution Phytoplankton- Diatoms Coral reef restoration Mollusks –Bivalves/Phaneragmes marines  Marine Pharmacology
<b>NON RESIDENT PARTNERS</b>		
Pr. LASSERRE Gérard Pr. NARDO Vicente Pr. BILSTAD Torleiv	Researcher U. Montpellier2 Oceanographic Institut Paul Ricard Professor University- Savagery (NW)	ICZM- Marine Ressources Management Aquaculture – Coastal Ecosystem Water Science and Technology
<b>ADMINISTRATION</b>		
BEHAVA Issa Alfred RAVAOARISOA Léa GARAMO Jean Paul TOMARA Sofia		Account Controller Finance officer Vaguemester Logistic

### APPENDIX 3: LIST LABORATORIES AND MAIN FACILITIES

- 1 Laboratory of Microbiology
- 1 Laboratory of Marine and Environment chemistry
- 1 Laboratory of Marine Biology
- 1 Oceanographic National database center

- 2 Computer rooms
- 1 Diving Center
- 3 rooms for lecture (30 persons)
- 1 room for lecture (50 persons)
- 1 Library
- 1 Administration office
- 1 Hatchery (holothurians /sea urchins)
- 1 Holothurians farming
- 1 Site Ampasilava Tsifota
- 6 Trainees rooms
- 1 house for foreign researchers
- 1 Cafeteria
- 2 Bungalows – office for partners
- 2 motor boats