



**Project Document**  
**United Nations Development  
Programme**  
**Global Environment Facility**



**Governments of Comoros, Kenya, Madagascar, Mauritius,  
Mozambique, Seychelles, South Africa, Tanzania**

**Programme for the Agulhas & Somali Current Large Marine  
Ecosystems**

**Agulhas & Somali Current Large Marine Ecosystems Project**  
PIMS 2205

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***Brief Description:*** The Agulhas Current Large Marine Ecosystem (ACLME) stretches from the north end of the Mozambique Channel to Cape Agulhas and is characterized by the swift, warm Agulhas current, a western boundary current that forms part of the anticyclonic Indian Ocean gyre. The Somali Current Large Marine Ecosystem (SCLME) extends from the Comoros Islands and the northern tip of Madagascar up to the Horn of Africa. It is characterized by the monsoon-dominated Somali current, which has a strong, northerly flow during the summer, but reverses its flow in the winter. These two LMEs are both complex and interactive, and are strongly influenced by the South Equatorial Current, which is funneled across the Mascarene Plateau east of Madagascar before diverging north and south to become components of the Agulhas and Somali Currents. The LMEs are primarily defined by their bathymetry, hydrography, productivity and biota. They are characterized by a dynamic system of ocean currents and upwelling cells, which regulate climate and influence weather patterns, sea temperatures, water chemistry, productivity, biodiversity and fisheries. They also represent an important repository of living marine resources, which underpin the livelihoods of coastal communities in 10 countries and territories.

Biodiversity-wise, the area is considered to be a distinct biogeographical province within the larger Indo-West Pacific region with high levels of regional endemism and a high diversity of marine life, from phytoplankton and zooplankton that drive important commercial and artisanal fisheries, to charismatic and endangered species such as the Coelacanth, dugong, turtles, and many species of cetaceans. Habitat alteration, pollution, overexploitation of biological resources, and the adverse effects of environmental variability represent the main threats to the ecosystems. Environmental variability within the LMEs includes variations in surface seawater temperature, seasonal changes in temperature gradients across the Indian Ocean, and the El Niño Southern Oscillation (ENSO). This variability is a particular concern as it threatens the sustainability of coastal livelihoods, is altering critical habitats and their species compositions (e.g. coral reefs), and is hampering long-term management planning efforts.

Although the processes and ecosystem functions related to these two LMEs have a major influence on the societies and economies of the area, very little detailed information is available upon which to base effective, cooperative transboundary management initiatives. The management of marine resources is currently sectoral and country-based. The main barriers to the development of an ecosystem approach to transboundary management include inadequate data, lack of regionally based and coordinated monitoring and information systems, lack of national and regional capacity, and the absence of full stakeholder involvement. It is impossible, under this situation for governments to manage fisheries and other marine resources in the absence of an understanding of the ocean-atmosphere, trophic and biogeochemical dynamics that characterize the LMEs. Therefore there is a clear need for an effective assessment process to capture the requisite data to fill important gaps in information for management purposes. This project aims to replicate the highly successful approach used by the Benguela Current LME (BCLME) project wherein the presence of BENEFIT (the Benguela Environment Fisheries Interaction and Training Programme) was instrumental in providing much of the requisite scientific data and information necessary to the development of a TDA and subsequently focused the SAP which is now being used for regional management of the BCLME. The project will not only move the countries of the region toward an important WSSD target i.e. an ecosystem based approach to management of the LMEs, it will also help to achieve other WSSD targets including strengthened regional cooperation frameworks, and the maintenance or restoration of fish stocks on an urgent basis, where possible by 2015.

The proposed project is part of a multi-project, multi-agency Programme (The Programme for the Agulhas and Somali Current LMEs) to institutionalize cooperative and adaptive management of these LMEs. A phased approach is planned that progressively builds the knowledge base and strengthens technical and management capabilities at the regional scale to address transboundary environmental concerns within the LMEs, builds political will to undertake threat abatement activities and leverages finances proportionate to management needs. The Programme includes two parallel projects that address land-based sources of pollution (UNEP) and build knowledge for the purposes of managing industrial fisheries (World Bank). Phase 1 of the UNDP project will aim to address the significant coastal and offshore data gaps for these LMEs by capturing essential information relating to the dynamic ocean-atmosphere interface and other interactions that define LMEs along with critical data on artisanal fisheries, larval transport and nursery areas along the coast. The project aims to deliver TDAs and SAPs for the Agulhas Current LME and the southern part of the Somali Current LME (Kenya and Tanzania), which can be expanded when governance within the northern portion of the Somali LME, areas in Somalia, becomes more stable. The parallel UNEP and World Bank Projects will also feed pertinent information into the TDAs/SAPs formulation process, and identify policy, legal and institutional reforms and needed investments to address transboundary priorities. Collectively, the projects build foundational capacities at regional scale for management of the LMEs. Provision is made through the UNDP project for Programme coordination.

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## OPERATIONAL FOCAL POINT ENDORSEMENTS

COUNTRY	FOCAL POINT	ENDORSEMENT
Comoros		
Kenya		
Madagascar		
Mauritius		
Mozambique		
Seychelles		
South Africa		
Tanzania		

**SIGNATURES FROM GOVERNMENT, IMPLEMENTING AND EXECUTING  
AGENCY REPRESENTATIVES**

<b>On Behalf of Governments &amp; Agencies</b>	<b>Signature</b>	<b>Name</b>	<b>Title</b>
Comoros			
Kenya			
Madagascar			
Mauritius			
Mozambique			
Seychelles			
Tanzania			
South Africa			
UNDP			
UNOPS			

# TABLE OF CONTENTS

<b>PROGRAMME FOR THE AGULHAS &amp; SOMALI CURRENT LARGE MARINE ECOSYSTEMS..... I</b>	
<b>ACRONYMS AND ABBREVIATIONS..... VIII</b>	
<b>SECTION I: PROJECT RATIONALE..... 1</b>	
PART I: SITUATION ANALYSIS .....	1
<i>BACKGROUND – BIOLOGICAL CONTEXT</i> .....	6
<i>BACKGROUND – SOCIO ECONOMIC CONCERNS</i> .....	7
<i>BACKGROUND - POLICY AND INSTITUTIONAL CONTEXT</i> .....	9
<i>THREATS TO THE LMEs</i> .....	11
<i>BASELINE ANALYSIS</i> .....	13
PART II: STRATEGY .....	20
THE ECOSYSTEM APPROACH, LARGE MARINE ECOSYSTEMS .....	20
AND TRANSBOUNDARY ASSESSMENTS .....	20
<i>THE PROGRAMMATIC APPROACH</i> .....	20
<i>Project Objective, Outcomes and Outputs/Activities</i> .....	23
<i>INTER-LINKAGES BETWEEN PROGRAMME INTERVENTIONS</i> .....	35
<i>EXPECTED GLOBAL, NATIONAL AND LOCAL BENEFITS</i> .....	38
<i>COUNTRY OWNERSHIP, COUNTRY ELIGIBILITY AND COUNTRY DRIVENNESS</i> .....	40
<i>LINKAGES WITH UNDP COUNTRY PROGRAMMES</i> .....	41
<i>LINKAGES WITH GEF FINANCED PROJECTS</i> .....	41
<i>SUSTAINABILITY</i> .....	42
<i>REPLICABILITY</i> .....	43
<i>STAKEHOLDER PARTICIPATION</i> .....	43
PART III: MANAGEMENT ARRANGEMENTS .....	45
<i>IMPLEMENTING AGENCY CONSULTATIONS, LINKAGES, AND COOPERATION</i> .....	45
<i>EXECUTING ARRANGEMENTS</i> .....	46
PART IV: MONITORING AND EVALUATION PLAN AND BUDGET .....	48
<i>PROGRESS AND ON-GOING EVALUATION REPORTS</i> .....	49
<i>MID-TERM AND TERMINAL EVALUATIONS</i> .....	49
<i>EXTERNAL REPORTING</i> .....	49
<i>BUDGET</i> .....	50
<b>SECTION II: STRATEGIC RESULTS FRAMEWORK AND GEF INCREMENT .....52</b>	
PART I: INCREMENTAL COST ANALYSIS .....	52
PART II: LOGICAL FRAMEWORK ANALYSIS .....	61
<b>SECTION III. ATTACHMENTS .....66</b>	
ANNEX 1: <i>MAP OF PARTICIPATING COUNTRIES WITH EEZ MAPPING</i> .....	66
ANNEX 2: <i>A SUMMARY OF OCEANOGRAPHIC KNOWLEDGE IN THE AGULHAS AND SOMALI CURRENT LMEs</i> .....	67
ANNEX 3: <i>LINKAGES BETWEEN ASCLMEs PROJECT AND NATIONAL DEVELOPMENT PLANS</i> 71	
ANNEX 4: <i>THREATS MATRIX</i> .....	73
ANNEX 5: <i>SUMMARY OF SWIOFP AND WIO-LaB PROJECTS</i> .....	77
ANNEX 6: <i>PROGRAMMATIC LINKAGES (ASCLMEs Project/ SWIOFP/ WIO-LAB)</i> .....	81
ANNEX 7: <i>IDENTIFIED PRIORITY AREAS FOR ASSESSMENT AND MAIN DATA GAPS</i> .....	84
ANNEX 8: <i>PROGRAMME AREAS, LME MODULE, AND FUNDING SOURCE</i> .....	100
ANNEX 9: <i>PLANNING AND STRATEGY FOR THE OCEANOGRAPHIC SURVEYS ASSOCIATED WITH THE ASCLMEs PROJECT</i> .....	105
ANNEX 10: <i>LINKAGES TO RELATED GEF PROJECTS</i> .....	108
ANNEX 11: <i>RESPONSE TO STAP REVIEWS</i> .....	111
ANNEX 12: <i>REFERENCES</i> .....	117
ANNEX 13: <i>Council Comment and Responses to Council Comments</i> .....	119
ANNEX 14: <i>Monitoring and Evaluation Plan</i> .....	125
ANNEX 15: <i>Public Participation Plan</i> .....	135
ANNEX 16: <i>Programme Coordination Plan</i> .....	166

*ANNEX 17: Project Terms of Reference* .....174  
*ANNEX 18: UNEP Preliminary TDA – ASCLMEs Region / UNEP Identified Major Transboundary Issues*  
.....188  
*ANNEX 19: The ACEP and Cross Project/Programme Linkages* .....217

## LIST OF ANNEXES:

Annex 1:	Map of the EEZs of Participating Countries
Annex 2:	Summary of Oceanographic Knowledge in ASCLMEs
Annex 3:	Linkages between ASCLMEs Project and National Development Plans
Annex 4:	Threats Matrix
Annex 5:	Summary of SWIOFP and WIO LaB Projects
Annex 6:	Project Linkages between ASCLMEs Project, WIO LaB and SWIOFP
Annex 7:	Identified Priority Areas for Assessment and Main Data Gaps
Annex 8:	Project Areas, LME Modules and Funding Sources
Annex 9:	Planning and Strategy for the Oceanographic Surveys Associated with the ASCLMEs project
Annex 10:	Linkages to Related GEF Projects
Annex 11:	Response to STAP Reviews (With Reviews appended)
Annex 12:	References
Annex 13:	Council Comment/Responses to Council Comment
Annex 14:	Monitoring and Evaluation Plan
Annex 15:	Public Participation Plan
Annex 16:	Programme Coordination Plan
Annex 17:	Project Terms of Reference
Annex 18:	UNEP Identified Major Transboundary Issues
Annex 19:	The ACEP and Cross Project/Programme Linkages

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## LIST OF TABLES

Table 1:	ASCLMEs Country Background Data
Table 2:	Agulhas and Somali Current LMEs – Country Profiles of International Agreements
Table 3:	Institutional Context – Regional Institutions
Table 4:	Description of the Threats to the LMEs
Table 5:	Project Related Baseline Activities
Table 6:	Linkages between LME Modules and Project Responsibilities
Table 7:	List of Data Gaps and Proposed Assessment Methodologies
Table 8:	Management Applications for New Information Arising from the Assessment Process
Table 9:	Risks and Risk Mitigation Measures
Table 10:	Participation Plan – Products and Targets
Table 11:	Monitoring and Evaluation Template
Table 12:	Output Budget for Project
Table 13:	Regional Baseline and Gaps
Table 14:	Project Incremental Cost Matrix
Table 15:	Baseline Activities by Country

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## LIST OF FIGURES

Figure A/B:	Map of the ASCLMEs region showing participating countries, continental shelves and high seas.
Figure C:	Organigram of Project Management Structure

## ACRONYMS AND ABBREVIATIONS

AA Monsoon	Asian-Australian Monsoon
ACEP	African Coelacanth Ecosystem Programme
ACLME	Agulhas Current Large Marine Ecosystem
ASCLMEs	Agulhas and Somali Current Large Marine Ecosystems
CBD	Convention on Biological Diversity
CB&T	Capacity Building and Training
CBOs	Community-based Organizations
CCRF	Code of Conduct for Responsible Fisheries
COI	Indian Ocean Commission
CORDIO	Coral Reef Degradation in the Indian Ocean
CRC	University of Rhode Island Coastal Resources Centre
DEAT	Department of Environmental Affairs and Tourism (South Africa)
DIM	Data and Information Management
DLIST	Distance Learning and Information Sharing Tool
DSS	Decision Support System
EAC	East African Commission
EAME	East African Marine Ecoregion
EET	Environmental Endowment Trust
EIA	Environmental Impact Assessment
ENSO	El Niño Southern Oscillation
FAD	Fish aggregating device
FAO	Food and Agricultural Organization
GCRMN	Global Coral Reef Monitoring Network
GEF	Global Environment Facility
GEMPA-EA	Group of Experts in Marine Protected Areas for Eastern Africa
GIS	Geographic Information System
GIWA	Global International Waters Assessment
GOOS	Global Ocean Observing System
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities
ICRAN	International Coral Reef Action Network
ICRI	International Coral Reef Initiative
ICZM	Integrated coastal zone management
IFREMER	(Institut Français pour la Recherche et l'Exploitation de la Mer)
IMS	Institute for Marine Sciences, Dar es Salaam, Tanzania
IOC	Intergovernmental Oceanographic Commission
IOTC	Indian Ocean Tuna Commission
IUCN	The World Conservation Union
IW	International Waters
IW:LEARN	International Waters Learning Exchange and Resource Network
LME	Large Marine Ecosystem
MA	Modular Approach to LME Management
MCM	Marine and Coastal Management Division of the DEAT (South Africa)
MDGs	Millennium Development Goals
M&E	Monitoring and Evaluation
MODIS	Moderate Resolution Imaging Spectroradiometer
MPA	Marine Protected Area
MPRU	Marine Parks and Reserves Unit
NBSAP	National Biodiversity Strategy and Action Plan
NEAP	National Environmental Action Plan
NEMC	National Environment Management Council (Tanzania)
NEPAD	The New Partnership for Africa's Development



NFP	National Focal Point
NGFPA	National Government Focal Point Agencies
NGO	Non-Governmental Organization
NOAA	National Oceanographic and Atmospheric Administration (USA)
NORAD	Norwegian Agency for Development Cooperation
OAU	Organization for African Unity
ODINAfrica	Ocean Data and Information Network for Africa
ORI	Oceans Research Institute (Durban, South Africa)
PA	Programmatic Approach for the Agulhas and Somali LMEs
PM	Project Manager
PDF	Project Development Facility
PIR	Project Implementation Review
POPs	Persistent Organic Pollutants
PPER	Project Performance and Evaluation Review
PSC	Project Steering Committee
QA	Quality Assurance
QC	Quality Control
SADC	South African Development Community
SAP	Strategic Action Programme
SCLME	Somali Current Large Marine Ecosystem
SeaWiFS	Sea-viewing Wide Field-of-view Sensor
SIDS	Small Island Developing States
STAP	Science and Technical Advisory Panel of the GEF
SWIOFC	Southwest Indian Ocean Fisheries Commission
SWIOFP	Southwest Indian Ocean Fisheries Programme
TAFIRI	Tanzania Fisheries Research Institute
TDA	Transboundary Diagnostic Analysis
TOR	Terms of References
TPR	Tri-partite Review
UNCLOS	United Nations Convention on Law of the Sea
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNOPS	United Nations Office for Project Services
WB	World Bank
WCS	Wildlife Conservation Society
WIO	West Indian Ocean
WIO-LaB	UNEPGEF Project: Addressing land-based activities in the Western Indian Ocean
WIOMSA	West Indian Ocean Marine Sciences Association
WIOTOC	Western Indian Ocean Tuna Organization Convention
WMU	WIO-LaB Managing Unit
WWF	World Wide Fund for Nature

## SECTION I: PROJECT RATIONALE

### PART I: SITUATION ANALYSIS

1. The West Indian Ocean (WIO) region includes 10 countries and dependencies<sup>1</sup> (See **Table 1** below for data on land and sea areas). The region encompasses two of the world's 64 identified Large Marine Ecosystems (LMEs), the Agulhas Current LME and the Somali Current LME (see **Figure 1** for location). The Agulhas Current LME (ACLME) in the South is a typical western boundary current system, the largest of its kind in the World. It includes the Agulhas Current proper which runs westwards along the east coast of South Africa, as well as its source regions in the Mozambique Channel and east of Madagascar. The Somali LME (SCLME) extends geographically south-to-north from the Comoros Islands and the northern tip of Madagascar to the horn of Africa. A large number of ocean currents predominate - notably the East African Coastal Current, South Equatorial Current, the East Madagascar Current, and the East African Coastal Current. During the southwest monsoon, the SCLME becomes one of the most intense coastal upwelling systems in the world, bringing rich nutrients to the surface waters. The SCLME supports a sizable pelagic tuna fishery. Similarly, the ACLME is an area characterized by dynamic nutrient cycling and upwelling cells with coupled fisheries potential. However, many of the ecosystem-related functional areas, such as upwellings, larvae recruitment zones, nurseries and breeding grounds, areas that demonstrate resistance to coral bleaching, etc., are generally poorly known, despite their great ecological and economic importance for the region.

**TABLE 1: ASCLMEs COUNTRY BACKGROUND DATA (2003 DATA, WORLD BANK)**

Country	Land Area km <sup>2</sup>	Coastline km	EEZ km <sup>2</sup>	Population millions	GDP US\$ billion
Comoros	217	427	100,000 (est)	0.6	0.32
Kenya	586,000	640	100,000 (est)	31.3	13.8
Madagascar	587,000	4,500	1,150,000	17	6
Mauritius	1,860	276	1,500,000 (est)	1.2	5
Mozambique	800,000	2,700	400,000 (est)	18.8	4.3
Seychelles	455	600	1,300,000	0.08	0.72
Somalia	637,000	3,320	600,000 (est)	9.6	No Data
South Africa	1,220,000	2,798	540,000 (est)	45.3	159.8
Tanzania	945,000	1,424	280,000 (est)	36	9.9

2. Available knowledge indicates that the ASCLMEs region encompasses a high degree of biodiversity and endemism. Both LMEs are considered to be moderately productive based on global primary productivity estimates<sup>2</sup>. The LMEs have been characterized by GIWA as being severely impacted in relation to the overexploitation of fisheries. However, statistics are generally poor, and the precise impact of fishing methods is still speculative. There are clear gaps in the understanding of coastal and marine ecosystems within the ASCLMEs.

3. New information<sup>3</sup> is now coming to light regarding the ASCLMEs area which is altering the previous understanding of the complex ocean-atmosphere dynamics in the region and their relationship to ecosystem functions such as productivity, larval transport and fisheries. Previously unknown channels (some over 10km in width and over 100 m deep) have recently been discovered

<sup>1</sup> The region includes 8 countries, eligible for GEF financial assistance: Comoros, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, South Africa, and Tanzania. The region also includes Somalia and the French Indian Ocean dependencies.

<sup>2</sup> SeaWiFS global primary productivity estimates

<sup>3</sup> Presented at a recent (2004) Discussion Meeting at the Royal Society, London reviewed current knowledge of the Atmosphere-Ocean-Ecology Dynamics in the Western Indian Ocean

around the Mascarene Plateau (East of Madagascar) which influence the flow of the South Equatorial Current and associated nutrient and productivity relationships. Species of invertebrates that are new to the area are being discovered and it is expected that many taxa new to science would be identified after analysis of recent collections. Extensive areas of previously unmapped seagrass beds and shallow coral reefs have also been identified. Scientists conclude there is still a great lack of information about the area, not only in absolute terms, but also relative to other oceans such as the Pacific. In order to develop systematic management frameworks for the LMEs and their constitute habitats, a better integration of the information on ecology, oceanography, biophysics and human requirements is needed, as is data in areas where it is lacking and a better understanding of the complex interactions and linkages among the various marine ecosystems.

4. Better prediction of climatic and oceanographic variability (essential, for example, in the context of rain-fed agriculture, watershed welfare and the management of sustainable marine resources use) is of critical importance to the developing countries of this region. There is also an urgency to synthesize accurate data on the state of the region's artisanal fisheries and its linkages to the physicochemical and biological functions within the LMEs as well as its interactions with the offshore commercial fisheries. Furthermore, there is inadequate data regarding larval transportation and the distribution and welfare of important nursery areas around the coastlines of the LMEs. All of these gives strong justification and impetus to the urgent requirement for gathering baseline information and developing coordinated monitoring and observation systems, as needed to provide a management framework.

5. A global effort is currently underway led by the World Conservation Union (IUCN), the Intergovernmental Oceanographic Commission (IOC) of UNESCO, other UN agencies (including UNDP, UNEP and the World Bank) and the United States' National Oceanic and Atmospheric Administration to improve the long-term sustainability of resources and environments of the world's LMEs. Further information on this initiative can be found on the LME website at [www.edc.uri.edu/lme](http://www.edc.uri.edu/lme). This website lists details regarding the current status of each of the world's LMEs and notes that within the ASCLMEs region there is a need to implement monitoring efforts on spatial and temporal scales to identify the ecosystem effects of climate change and to discover the major driving forces causing large scale changes in biomass yields. The site further concludes that research assessment and management Programmes need to be implemented in order to address long-term governance concerns. The GEF has developed a strategy (based on lessons from its Benguela Current LME Project) for undertaking such recommended assessments (particularly in areas like the ASCLMEs region where data is limited) and then using this vital information to inform a standard process of Transboundary Diagnostic Analysis (TDA) which in turn provides the foundation for the development of a Strategic Action Programme for cooperative management and better regional governance of LMEs.

6. Figure A (below) shows the area surrounding the ASCLMEs and constitutes the approximate System Boundary for the Proposed Project. Figure B outlines the currently established geographic contours of the LMEs.

## **BACKGROUND - PHYSICOCHEMICAL INFORMATION**

7. The two identified LMEs addressed by this project sit within the western Indian Ocean region along the eastern coastline of Africa with the ACLME to the south and the SCLME to the north. (see Figure B). This oceanic region harbors a variety of submerged geomorphological features, including abyssal plains, oxygenated slopes and basins, mid-ocean ridges seamounts and ocean trenches<sup>4</sup>. Some of the deep ocean trenches range from 6,000 to 7,000 meters in depth. Continental shelves in the region tend to be narrow in the north, along the Somali coast, and gradually widen further to the south. The average depth of these shelves range from 200-300 meters. The region has a number of key geographic features, which influence the biological and physicochemical environment. These

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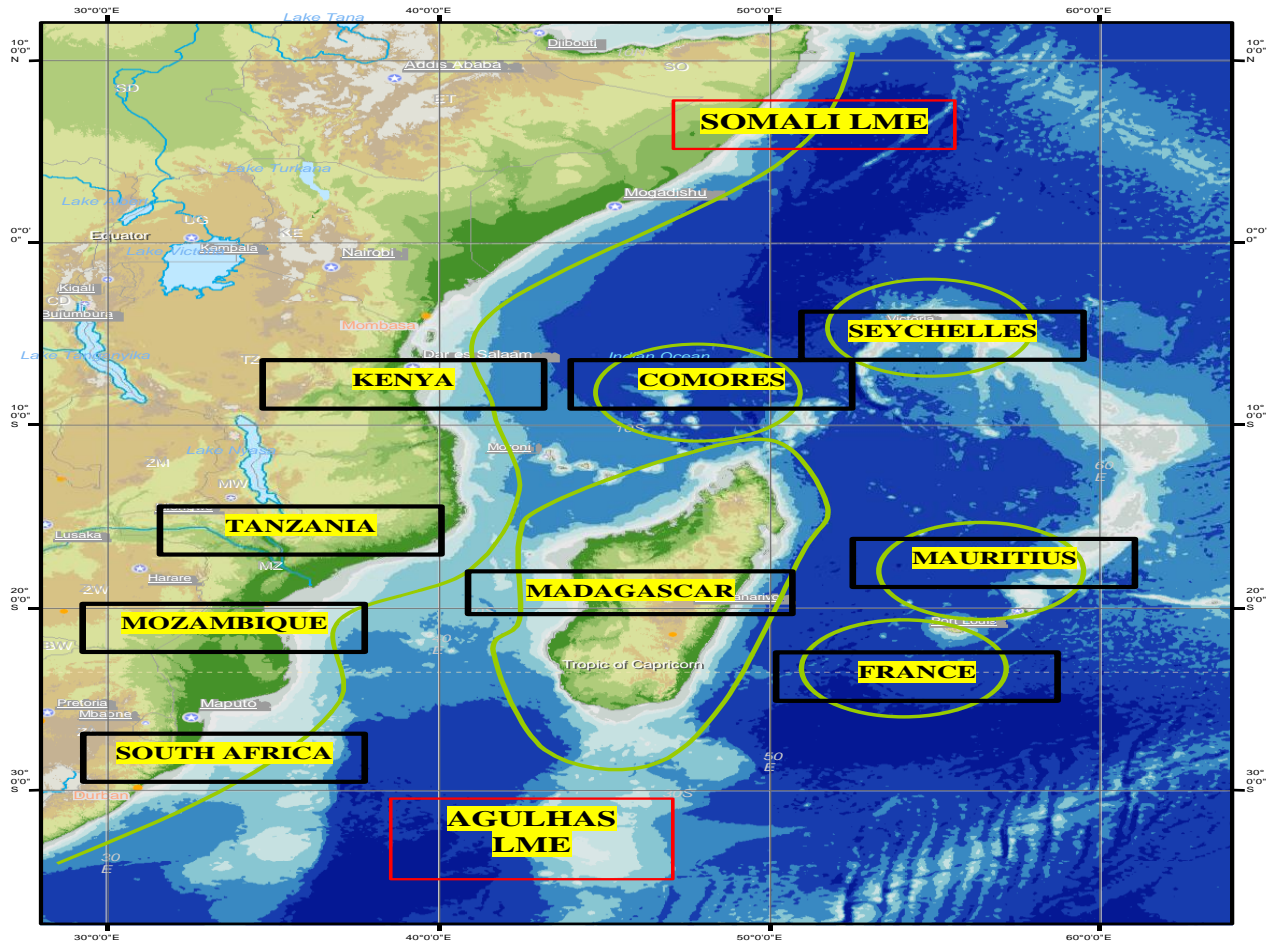
<sup>4</sup> Bablan Ingole and J. Anthony Koslow, Indian Journal of Marine Sciences, Vol. 34 (1), March 2005.

include the Mascarene Plateau which extends as a fault-composite arc for 2300 km from the Equator southward, with water depths ranging from 0 to 100 m.<sup>5</sup> . The Plateau acts as a barrier to latitudinal water flows and is therefore of distinct, regional importance and almost certainly influences both the ACLME and the SCLME.

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<sup>5</sup> Rolph Payet. The Royal Society Press (In-press).

**FIGURE A: MAP OF THE ASCLMES REGION SHOWING PARTICIPATING COUNTRIES, CONTINENTAL SHELVES AND HIGH SEAS**



**AGULHAS CURRENT LME**

**SOMALI CURRENT LME**

**FIGURE B: MAP OF AFRICA AND INDIAN OCEAN SHOWING POSITIONS OF AGULHAS CURRENT AND SOMALI CURRENT LMES (IN RED)**

8. The prevailing wind regimes can be divided into two distinct systems: the monsoon regime that dominates the Somali Current LME), and the subtropical high-pressure system that dominates the southern part (the Agulhas Current LME). The Northeast Monsoon affects the climate of the northern Indian Ocean from December to April and is characterized by northeasterly winds over the tropics and northern subtropics. The Northeast Monsoon has winds of moderate strength, with dry terrestrially derived air and the wind direction tends to be from Arabia to Madagascar. In contrast, during the months of June to October, the Southwest Monsoon reverses the wind direction and the winds then tend to be much stronger, with an intense wind jet developing along the high east African mountains. However, strong winds blow steadily over the entire western Indian Ocean north of the equator. During the summer disturbances in air pressure and wind movement frequently create cyclones. These cyclones can intensify to become hurricanes that move in a westerly direction. Those that make landfall generally do so over Mauritius, Madagascar or Mozambique and can cause extensive wind damage and flooding, with an attendant loss of life. The subtropical part of the region to the south is dominated by the normal high-pressure system prevalent in these latitudes. The pressure differences prevailing in the region cause the Trade Winds that are geographically uniform over the western Indian Ocean, but stronger than those prevailing in other oceans. The wind patterns in the Indian Ocean are primarily influenced by its geography and, in particular its proximity to two large continental masses.

9. The Agulhas Current is the western boundary current of the South Indian Ocean and flows down the east coast of Africa from 27°S to 40°S<sup>6</sup>. The source water for the current derives from the Mozambique Channel eddies<sup>7</sup> and the East Madagascar Current with the greatest source of water arriving through re-circulation of the southwest Indian Ocean sub-gyre<sup>8</sup>. The movement and direction of the current varies both seasonally and geographically across its extent. Generally, it is limited to the top 2,300m of the ocean<sup>9</sup> but this depth limit increases with increasing latitude and there is a further seasonal variation causing oscillation in sea surface height within the current. The main variability within the Agulhas Current is the large, solitary meanders (natal pulses)<sup>10</sup> which occur about 6 times per year. These then spawn an Agulhas ring that subsequently moves into the South-East Atlantic Ocean. The warm-water link between the Indian and South Atlantic Oceans is likely to have a strong influence on global climate.

10. The Somali Current, the western boundary current of the northwest Indian Ocean, reverses direction with season. During the Northeast Monsoon, the Somali Current flows south and meets the north flowing coastal East African Coastal Current (which derives from the South Equatorial Current). With the transition from Northeast to Southwest monsoons, an intense Indian Equatorial Jet (EJ) develops within these waters. The behavior and effect of this jet is still not well known, however studies show that the jet generally appears between April and June for short (one-month) periods. The jet may result in a physical forcing although its influence on productivity is still not well understood. The East African Coastal Current's geographical extent is seasonally determined so that its interaction with the Somali Current shifts southward as the Monsoon progresses<sup>11</sup>. During the Southwest Monsoon the East African Coastal Current strengthens causing the Somali Current to change direction and flow northward as an intense coastal jet that may reach velocities of 3.5 meters per second. The flow trajectory along the coastline is complex and a strong upwelling cell develops as a result. Two coastal upwelling gyres also develop which combine as the monsoon intensifies. By the time the Southwest Monsoon peaks in August the Somali Current is established as a continuous current running from the East African Coastal Current (south) to the East Arabian Current (north).

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<sup>6</sup> Gordon, 1985

<sup>7</sup> de Ruijter et al., 2002

<sup>8</sup> Gordon, 1985; Stramma and Lutjeharms, 1997

<sup>9</sup> Donohue et al., 2000

<sup>10</sup> Bryden et al., 2003, Lutjeharms et al., 2003, Van Leeuwen et al., 2000

<sup>11</sup> The surface waters of the East African Coastal Current are prevented by the Monsoon from moving northward during this season; at depth however, the current continues as an undercurrent below the Somali Current.

Nutrients and primary productivity in the surface waters are generally low, although this is seasonal with higher values being associated with surface waters in the upwelling areas.

11. However, new studies and research<sup>2</sup> are replacing the traditional view (inter-seasonal and inter-annual climate variability in the Agulhas and Somali Current LMEs (ASCLMEs) region, and particularly the cycle of seasonally reversing monsoon winds) with a more complex picture of long-term air-sea interactions and ocean-atmosphere dynamics. One of the most notable forcing agents behind these climatological and oceanographic boundary changes is the Mascarene Plateau which interrupts the westward flow of the South Equatorial Current and consequently determines the fluxes of water, nutrients and biogeochemical constituents – the essential controls on ocean and shallow-sea productivity and ecosystem health. The Plateau extends in range some 2,000 km from the Seychelles in the north to Reunion in the south and covers an area of approximately 115,000 km<sup>2</sup> with water depths ranging from 8-150 meters. At its edge it plunges some 4,000 meters to the abyssal plain. Recent data from the Mascarene Plateau<sup>12</sup> indicate support for the theory that an open-ocean upwelling system is associated with this area. Further evidence<sup>13</sup> shows that the flow of the South Equatorial Current delivers high levels of nutrients to the waters of the central and northern Plateau regions, which may be responsible for higher levels of productivity in these areas all the way up the food chain. There is growing evidence that the Mascarene Plateau area may represent a separate LME in its own right.

12. There is limited information available on the wider chemical oceanography of the ASCLMEs region. The area is considered to be very oligotrophic and characterized by low nutrient concentration, low phytoplankton biomass and a predominance of regenerated production. Ammonium is found to be the major nitrogen substrate supplying between 50-99% of the phytoplankton nitrogen requirements. Nutrient levels do vary seasonally, especially between the monsoons. The Indian Ocean generally is subject to large variations in salinity as a result of drastic changes in rainfall both seasonally and from year to year (again, associated with the monsoons). Sea surface salinity is affected by rainfall, but is also affected by anomalous anticyclonic winds blowing in the southeast Indian Ocean block the transport of saltier water out of the western Indian Ocean. Winds in the region are seen to effect salinity and rainfall both of which are linked to El Nino events.

13. Annex 2 provides a summary of the present day oceanographic knowledge within the ASCLMEs region. Maps depicting the surface currents of the ASCLMEs appear below in Annex 7.

## BACKGROUND – BIOLOGICAL CONTEXT

14. The region's mangroves, seagrass beds and coral reefs reflect a high degree of biodiversity and endemism and, along with beaches and estuaries, serve as a home, breeding ground and/or nursery areas for many species (see [www.edc.uri.edu/lme](http://www.edc.uri.edu/lme) for references). Ocean currents in the area disperse the larvae of fish and crustaceans from spawning areas to other habitats, and thus play an important role in recruitment. The exact dispersal mechanisms and range of species remain poorly known, and associated ecological and physical processes need to be studied. However, the inshore current is thought to play an important role in larvae dispersal in the Somali Current LME, along the coastlines of Kenya and Tanzania, while in the Agulhas Current LME, the South Madagascar upwelling is thought to supply recruits for parts of the Mozambique Channel (Lutjeharms, 2004). The Angoche upwelling, off the coast of Mozambique is thought to be similarly important in this regard (ibid). This also holds true for coral dispersion where it is now generally accepted that one reef system can provide the spawning recruitment for another reef system some hundreds of miles down-current. A better understanding of these processes is needed in order to identify priority areas for conservation endeavors, while improving the ability to adapt fisheries management in the face of environmental variability. Several studies have indicated that the Agulhas Current is responsible for the dispersal of

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<sup>2</sup> Spencer *et al* 2005

<sup>12</sup> Gallienne, C.P. and D. Smythe-Wright, 2005

<sup>13</sup> New *et al*, 2005

the early life history stages of various fish species. Both the ACLME and the SCLME are Class II, moderately productive ecosystems (150-300gC/m<sup>2</sup>-yr) based on SeaWiFS global primary productivity estimates. Little is documented on seasonal fluctuations in zooplankton within these LMEs.

15. Over 11,000 marine fauna are currently recorded from the western Indian Ocean region (island states included). The species inventory is however incomplete, and there are large gaps in the data set. Existing data are based largely on fragmented shallow-water surveys. The benthic invertebrates of deeper waters, especially those of the continental slope and abyssal zone, remain virtually unexplored<sup>14</sup>. Beyond the thirty meter gradient little is known about species diversity and population densities, and within the thirty meter gradient much remains to be described. According to some projections, less than 50% of the marine species actually present have been described and that, at existing rates of description, it will take 200 years to fully describe the remaining fauna (Griffiths, Indian J, Mar. Sci. In press). The region has a high diversity of marine life<sup>20</sup>, from phytoplankton and zooplankton that drive the fisheries, through several thousand species of larger invertebrates and fish of which many (such as tuna, lobster, shrimp, oysters, clams, etc.) are of economic significance, to charismatic species such as the Coelacanth, dugong, turtles and many species of cetaceans. There are also important seabird populations, particularly on the offshore islands.

16. Seagrass beds, coral reefs and mangrove forests provide important critical habitats of high diversity within the ASCLMEs. Of the 50 globally described seagrass species, 13 are found in the Mascarene Plateau area<sup>15</sup>. Preliminary data from the *Shoals of Capricorn* Marine Programme indicate very large, previously uncharted, seagrass beds in the Mascarene Plateau (Burnett *et al.* 2001). Coral reefs are found throughout the area providing important habitat for fish, invertebrates and lower organisms. These include fringing and patch reefs along the coast and offshore islands, although these are broken around river outlets. The region is characterized by high endemism amongst the coral fauna. The total predicted number of coral species in the western Indian Ocean is over 370 (UNEP-WCMC). Coral reef status has been assessed along the coastline of East Africa<sup>16</sup> and throughout the Indian Ocean Island States<sup>17</sup>. Coastal reefs cover an area in total of just under 7,000 km<sup>2</sup>. Mangrove forests are found mainly in nutrient rich river estuaries, including the estuaries of the Limpopo, Zambezi and Rufiji and Tana Rivers. These habitats are critical fish spawning and nursery areas, and provide other vital ecological services, such as shoreline shelter from ocean swells.

17. Seamounts may be rare within the ASCLMEs or around the Mascarene Plateau, but so little is known regarding the bathymetry and topography of certain areas within the region (especially the Mascarene Plateau) that lack of knowledge of the presence of seamounts may be a reflection of the general lack of knowledge for this area.

## BACKGROUND – SOCIO ECONOMIC CONCERNS

18. 160 million people reside in countries bordering the ASCLMEs area while the overall coastal population in the region (including the islands) is estimated at some 55 million. The region is characterized by some of the highest poverty levels in the world. This population is greatly influenced by environmental phenomena linked to the Indian Ocean. Most nations in the area place great reliance on the sea to assure food security through the harvest of living marine resources for subsistence and employment including from artisanal fisheries, transport and coastal tourism industries.

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<sup>14</sup> Ibid

<sup>15</sup> Ibid

<sup>16</sup> Obura *et al.*, 2005

<sup>17</sup> Ahamada *et al.*, 2005



19. The Agulhas and Somalis Current LMEs support regionally important fisheries, with industrial fishery landings of approximately 280,000 metric tonnes per annum (FAO 2002)<sup>18</sup>. The main industrial fisheries include the tuna fisheries, and smaller fisheries for orange roughy, squid, lobster and prawns. The fishing industry provides a significant contribution of foreign exchange to the region. Fisheries exports of US\$943 million significantly surpassed imports of US\$227 million in 2002. Catches by vessels of non-African states represent about 25 to 30 percent of fish catch. Commercial fishing for shrimp and for pelagic species such as tuna have secondary effects in their impact on other species such as cetaceans and turtles, while processing factories and port developments have an impact on the coastal zone in terms of pollution, habitat destruction and the concentration of people. Meanwhile, data suggests fishing effort is escalating, especially by distant fishing nations operating in international waters. Inevitably this expanding fishing effort will focus on the upwellings and higher nutrient and productivity areas associated with the Agulhas and Somali Current LMEs and the Mascarene Plateau. However, most of the region's fisheries go unreported in global statistics, largely due to their unregulated and informal nature.

20. Fish often represent the primary source of animal protein for many local communities in the region. Nutritionally, fish are an important source of protein, especially where other sources of animal protein are scarce or expensive. This is particularly the case in the Small Island Developing States (SIDS). The share of fish to animal protein exceeds 50% in Seychelles and Comoros and is greater than 20% in all countries except Kenya, South Africa and Madagascar. Rice, maize, wheat and cassava make up the bulk of the food consumed by the people of the region. However there are essential micro-nutrients not found in these staples or found only in small quantities, for example iron, iodine, zinc, calcium, and vitamin A. Symptoms of these deficiencies in the region include goitre. Fish are particularly rich in these micronutrients, for example iodine, and also contribute fatty acids necessary for the development of the brain and body. The importance of fish in the diet of a population is therefore now widely recognized, especially for the diets of young children, infants and pregnant women. Further, fish harvesting, processing and marketing generates livelihoods, employment and income for approximately 2.2 million people along the coast of the ASCLMEs. Although employment cannot be taken as a firm assurance of food security, artisanal fisheries exist in coastal areas where alternative employment opportunities are scarce. The sector thus makes a key contribution to household welfare (including both subsistence and income generation).

21. Artisanal and subsistence fishers take a much wider range of fish and invertebrates than do industrial/commercial fisheries. This is because small-scale fishers of the region are resourceful in developing different fishing techniques to take advantage of every possible niche available for harvesting. More than 100 artisanal fishery types have been identified and described for the region which range from passive trap fishing to labor-intensive seine netting and spear fishing<sup>19</sup>. The IOTC estimate that artisanal fishermen now take as many of the 16 tuna species in the Indian Ocean as a whole as do the industrial fleets. This may serve to highlight the significance of the need for a clear definition between artisanal and subsistence fishermen. Artisanal fishing, which generally requires low financial capital inputs, often constitutes the basis of a diversified livelihood strategy for coastal communities. It can help to i) spread risks between various economic activities in an uncertain environment and therefore reduce vulnerability, ii) create a synergy with other livelihoods and enhance capital accumulation, and iii) generate cash. Fishing, even as a secondary activity, is important for the generation of income for coastal communities along a large swathe of the region's coastline. Most of the region's 236,000 fishers use low technology gear (harpoons, hand lines, traps, seines and nets) that take a diverse catch of fish and invertebrates, including, at times, other marine animals (e.g. turtles). One of the main social concerns relating to artisanal fisheries is the need to improve the social and economic situation of traditional fishing communities. There is considerable

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<sup>18</sup> This estimate does not take to account takings from distant water fishing fleets in international waters and does not take full account of artisanal fisheries. According to other estimates, the total catch including subsistence, artisanal and industrial landings, and takings by distant water fishing nations in international waters, approaches 4 million metric tonnes<sup>18</sup> per year (Van der Elst, 2004).

<sup>19</sup> Western Indian Ocean Environment Outlook. 2000

evidence that such communities are amongst the poorest segments of society in the region. This situation is getting worse as the number of artisanal fishermen increase as a reflection of the lack of alternatives within the local economies.

22. The problem of poverty has been aggravated by recent drought situations that have hit parts of the region in the recent years, manifested in recurring food crises. Poverty and food security are linked concepts. People who are chronically poor usually lack access to food. Additionally, malnutrition negatively affects people's working and learning capacity, and may affect vulnerable groups living just above the poverty threshold, causing them to enter the ranks of the poor. Poverty in the region is particularly acute among vulnerable groups such as households headed by the elderly and children (that are now on the increase due to the impact of the HIV/AIDS pandemic). Fisheries workers are a group highly vulnerable to HIV/AIDS, often as a result of the migrant nature of their work. Increased understanding of the nature of the fisheries in the region, in particular near-shore fisheries will serve to enhance their management. This will ensure that fish remains an important food source for coastal communities over the long-term horizon. This is especially important on the African coastline where HIV/AIDS infection rates can be as high as 20-25% and where the compound effects of morbidity from the illness and malnutrition (i.e. from food crises) is leading to high mortality amongst vulnerable groups.

## BACKGROUND - POLICY AND INSTITUTIONAL CONTEXT

### *International, regional and national policy frameworks*

23. Environmental management activities in the region are aligned with a number of global and regional policy frameworks. Table 2 summarizes the key policy frameworks pertaining to the ASCLMEs region.

TABLE 2: AGULHAS & SOMALI CURRENT LMES COUNTRY PROFILES – INTERNATIONAL AGREEMENTS

Convention / membership	Somalia	Kenya	Tanzania	Mozambique	South Africa	Madagascar	Comoros	Seychelles	Mauritius	France	EC
UNCLOS III (1982)	X	X	X	X	X	X	X	X	X	X	X
Nairobi (UNEP)	X	X	X	X	X	X	X	X	X	X	X
FAO Code declaration	X	X	X	X	X	X	X	No	X	X	X
Straddling stocks	No	No	No	No	X	No	No	X	No	X	X
SWIOFC		X	X	X	X	X	COI BLOCK OF 'TUNA COUNTRIES' X				X
IOTC	No	X	No	No	X	X	X	X	X	X	X
WIOTOC	No	No	No	X	No		X	X	X		

Convention / membership	Somalia	Kenya	Tanzania	Mozambique	South Africa	Madagascar	Comoros	Seychelles	Mauritius	France	EC
COI	No	No	No	No	No	X	X	X	X	X	X
EAC	No	X	X	No	No	No	No	No	No	No	No
SADC	No	No	X	X	X	X	No	No	X	No	No
COMESA	No	X	X	No	No	X	X	X	X	X	X

24. Table 3 describes the regional institutions established to give effect to these frameworks.

TABLE 3: INSTITUTIONAL CONTEXT - REGIONAL INSTITUTIONS

<i>Institutions</i>	<i>Member Countries</i>	<i>Function/Mandate</i>
The Nairobi Convention	All participating countries of the project	To protect and manage the marine environment and coastal areas of the Eastern African region.
New Partnership for African Develop. (NEPAD)	All participating countries of the project	Development of a common and integrated regional platform for the management of marine and coastal resources as a model in Africa. Establishment of an Africa environmental resource centre under consideration.
South African Dev. Community (SADC)	Mozambique, South Africa, Madagascar, Mauritius and Tanzania	Marine Fisheries and Resources Programme aims at the development of marine fisheries in the SADC region. SADC supports a fisheries monitoring Programme in several member countries.
Indian Ocean Commission (IOC)	Comoros, Madagascar, Mauritius, Seychelles	Improve living standards in the participating countries. Promote cooperation in diplomacy, economy, trade, agriculture, fishing, and the conservation of resources and ecosystems.
Indian Ocean Tuna Commission (IOTC)	Australia, China, Comoros, Eritrea, European Community, France, India, Islamic Republic of Iran, Japan, Kenya, Republic of Korea, Sultanate of Oman, Madagascar, Malaysia, Mauritius, Pakistan, Philippines, Seychelles, Sri Lanka, Sudan, Thailand, United Kingdom and Vanuatu.	The IOTC is an intergovernmental organization mandated to manage tuna and tuna-like species in the Indian Ocean and adjacent seas. Its objective is to promote cooperation among its Members with a view to ensuring, through appropriate management, the conservation and optimum utilization of stocks.
Southwest Indian Ocean Fisheries Commission (SWIOFC)	Commission recently formed. Mandate developed and agreed upon. First meeting held and operations recently begun. Steering Committee comprised of Seychelles, France, E.C., Australia and New Zealand. Membership is open to any country within or bordering the SWIO, from Somalia to South Africa.	Functions proposed include measures intended to: Ensure long-term conservation of fisheries resources through application of an ecosystem approach; prevent or eliminate over-fishing and excess fishing capacity; apply a precautionary approach consistent with the FAO Code of Conduct and the 1995 Agreement; maintain fish stocks at levels that are capable of producing maximum sustainable yield, and rebuild stocks to those levels; seek to ensure that fisheries practices and management approaches take due account of need to minimize harmful impact on the marine environment; protection of

<i>Institutions</i>	<i>Member Countries</i>	<i>Function/Mandate</i>
		biodiversity; and give full recognition to the special requirements of developing States. The SWIOFC will not assume managerial functions.

25. Much work needs to be done to introduce ecosystem-based assessment and management to ASCLMEs countries. The policy framework for national ecosystem management is generally insufficient: all eight countries have national environmental plans and most countries have fisheries master plans; however, the international coordination of these plans through the participation of all stakeholders in the transboundary diagnostic analysis (TDA) and the strategic action plan (SAP) processes for these adjoining large marine ecosystems has not yet been undertaken. Several countries have instituted near-shore governance mechanisms or institutional structures to manage marine and coastal resources, but these have yet to be harmonized in international agreements regarding standardization of ecosystems condition assessment indicators, and the prioritization of agreed upon actions on which success depends. Some likely plans are embedded in integrated coastal zone management initiatives. Common policies and actions under development or adopted by countries throughout the region include:

- National Fisheries Management Strategies to promote sustainable and responsible fisheries development, optimization of sector benefits, development of fisheries-related MPAs, resolution of conflicts within and between artisanal and commercial fisheries, and improved monitoring and data collection to underpin the management of commercial fishing operations.
- Development of integrated ecosystem conservation and management approaches through management of coastal pollution, expanding the network of MPs, monitoring and control of coastal development, general monitoring of the coastal environment (including coral reefs and ecotoxicology)
- Promoting the involvement of coastal communities in a fair and equitable manner to achieve socially and economically sustainable resource exploitation and management.
- Promotion of sustainable development and economic recovery plans linked to the protection and maintenance of ecosystem functions.

26. Specific relevant policies in the participating countries are summarized in Annex 3.

#### **THREATS TO THE LMES**

27. Human induced pressures on the ASCLMEs are increasing at an accelerating pace. There are four primary threats to the ecological integrity of the ASCLMEs, namely:

- Human induced habitat destruction and alteration of the marine environment;
- Pollution of the marine environment;
- Overexploitation of fisheries resources; and
- High by-catch and incidental mortality of marine fauna in commercial fisheries operations; and adverse consequences related to anthropogenic related environmental variability within LMES.

Table 4 provides a more detailed description of these threats.

**TABLE 4: DESCRIPTION OF THREATS TO THE ASCLMEs**

<b>Threat</b>	<b>Description</b>
<b>Human induced habitat destruction and alteration of the marine environment</b>	Habitat destruction is manifest in the degradation of seagrass, loss of mangroves and damage to coral reefs. The severity of habitat disturbance varies throughout the region, with 'hotspots' concentrated in areas with high population densities and rates of population increase. Problems are particularly acute around urban and suburban centers. Mangroves are being cleared for mariculture or for salt production. Coral reefs are being mined in certain areas for lime and for construction materials, as well as for

Threat	Description
<p><b>Pollution of the marine environment</b></p>	<p>the curio trade. In several areas, coral reefs are also being damaged by the use of explosives for dynamite fishing, despite this practice generally being banned.</p> <p>Point and non-point land based pollution of coastal areas in the WIO is a growing problem. Large quantities of fertilizer and pesticides used in agricultural areas gradually make their way to the sea as runoff. Siltation has increased each year as a result of human activities on land such as mining, clearing for agriculture, industry, urban growth and dredging, and this is changing the coastal configurations of river deltas. Mining of titanium and zirconium, and mining-related activities in general, have adverse down stream impacts and disturb sand dune systems, wetlands and estuaries. Marine-based sources of pollution stem from the exploitation of the seabed for oil, minerals, sand and corals. Shipping around Cape Agulhas in South Africa, is exposed to extremes of weather conditions, which greatly increases the risk of major marine pollution incidents, particularly from oil tankers. Ship spills, ballast discharges, bilge washings, offshore oil exploration, and refinery effluents cause oil pollution. This type of pollution is particularly prevalent in the Somali Current LME because it includes major tanker routes carrying oil produced in the Persian Gulf to markets.</p> <p>Pollution from land based and marine sources is often localized, and currents play a major role in transporting pollutants from distant sources. The inshore circulation within the SCLME provides conveyance for the transport of pollutants on the Kenya/Tanzania coasts, including heavy metals and POPS from industrial centers in the region. In the ACLME, coastal currents running along the shoreline from Maputo in Mozambique through Kwa Zulu Natal in South Africa receive considerable urban and industrial runoff, and pollutants discharged by rivers. These currents are influenced by upwelling cells, which in turn have bearing on pollution transport to areas downstream.</p>
<p><b>Overexploitation of fisheries resources; and unnecessarily high by-catch and incidental mortality of marine fauna in commercial fisheries operations</b></p>	<p>Generally artisanal fisheries are considered to be fully or over-exploited in the region, especially near centers of population. There are now few, if any underexploited nearshore areas in the ASCLMEs<sup>20</sup>. Fishing intensities have increased dramatically over the past two decades, as a result of population increase along the coastal fringe. Known demersal and semi-pelagic (non-tuna) resources are generally heavily-exploited inshore and less-exploited offshore, although information on the pressures placed by distant fleet fisheries on the resource is still largely incomplete. Limited potential for increased catches exist except for Madagascar, Mozambique and Somalia where potential for increasing catches of some species may be significant. However, reported catches for Madagascar and Mozambique may actually be underestimates because of the difficulty of estimating artisanal catches over their long coastlines. Prawn fisheries have artisanal as well as industrial sub-sectors. The industrial sub-sectors account for significant export revenue and are limited-access fisheries managed to optimize economic return. Coastal prawn resources are heavily exploited.</p> <p>There is a significant by-catch problem in the ASCLMEs. While actual by-catch tonnage is impossible to quantify (about one-third of reported catch is not identified by species and illegal, unreported and under-reported catch would significantly increase by-catch tonnage) information on by-catch from the shrimp fishery is telling. The Trawl fisheries for shrimps in tropical and subtropical regions generate by-catch of up to 70 % of total catch, since this catch is of lower value than the target species it is normally discarded at sea.</p>
<p><b>Adverse consequences related to anthropogenic related</b></p>	<p>Human forced climate change in the region is increasing environmental variability, with ramifications for weather, fisheries and biodiversity. Oceanographic effects from climate change such as elevated water temperatures and changes in storm frequency have contributed to increased variability in catch and species composition. Increases in</p>

<sup>20</sup> Some minor areas of the coast of Mozambique and Madagascar excepted. For example, along an isolated stretch of coast between Inhambane (city) and Villanculos

Threat	Description
<b>environmental variability within LMEs</b>	<p>sea surface temperatures have had a severe impact on coral fauna, with episodic coral bleaching events tied to El Niño Southern Oscillation phenomena. The incidence of coral mortality following such events has increased dramatically. The coral bleaching events of 1998 reduced hard coral cover throughout much of the ASCLMEs area by between 30-95%. So far, the reefs of the Mascarenes have escaped mass mortality from bleaching, which now increases their conservation significance within the wider Indian Ocean where such mortalities have been widespread, and close to catastrophic in some areas. It is predicted that if management doesn't improve and there are repeated climate-related stresses (which are seen to be inevitable) then most of the reefs in the region will have less than 20% cover by 2014. Furthermore, acidification of the oceans as a result of increased carbon dioxide levels is another serious concern. Ocean acidification is essentially irreversible during our lifetimes. The impacts of ocean acidification on marine organisms and their ecosystems are much less certain. However, there is convincing evidence to suggest that acidification will affect the process of calcification, by which animals such as corals and molluscs make shells and plates from calcium carbonate. The tropical and subtropical corals are expected to be among the worst affected, with implications for the stability and longevity of the reefs that they build and the organisms that depend on them. Other calcifying organisms that may be affected are components of the phytoplankton and the zooplankton, and are a major food source for fish and other animals. Many low-lying coastal areas are extremely vulnerable to sea level rises associated with climate change. This is likely to cause losses in productive coastal lands and threaten wetlands and other coastal habitats. An increase in the frequency and intensity of extreme weather events associated with climate change, including cyclones and droughts is also expected. The degree of environmental variability caused by climate change is expected to be conditioned by ocean-atmosphere links, which remain poorly understood in the region. This is compromising the ability to plan adaptive measures.</p>

28. The NOAA LME site carries background information on each of the World's LMEs for each of the LME modules. The module on Ecosystem health and Pollution ranks the Somali Current LME as severely impacted in the areas of habitat and community modification, and fisheries. The same Module for the Agulhas Current LME lists it as being severely impacted through unsustainable exploitation of fisheries, i.e. overexploitation, excessive non-target species by-catch and discards, and destructive fishing (i.e. use of fine-mesh nets).

29. Although the GIWA process has yet to finalize its assessment of either the Agulhas Current or the Somali Current LMEs, it has reported on the assessment of the Indian Ocean Islands and the vast expanse of ocean between them. The most important transboundary concern identified by GIWA for that area is pollution as in (i) pollution of groundwater, surface water, and wetlands; (ii) risks for human health; (iii) degradation of coastal marine environments (including coral reefs) and tourist attractions such as beaches; (iv) possible disease outbreaks and the destruction of fisheries; (vii) accumulation and toxic effects of leachates; and (viii) eventually impact on the economy.

30. The aforementioned threats have determinants that may be separated into ultimate and intermediate root causes. Ultimate root causes include population increases especially in coastal areas, poverty (four of the participating countries rank among the thirty poorest countries in the world), and anthropogenically-induced climate change. The project is relevant to poverty reduction, and therefore to the amelioration of many of the root causes. These causes lie beyond the scope of this project. Intermediate root causes are capacity related: notably a deficit in capacities at the systemic, institutional and individual levels to manage the ecosystem. The root causes are elaborated in Annex 4. The basic lack of understanding of key LME processes is a major constraint in advancing joint management endeavors. The intermediate root causes are further elaborated in the following analysis of the baseline.

## BASELINE ANALYSIS

31. The business-as-usual course of events prevailing over the next 5 years in the absence of GEF intervention includes the activities of government ministries and institutes and donor activities aimed at managing marine resources at largely national level. These interventions make an important contribution towards the management of coastal and marine resources in the ASCLMEs region, and thus provide an important base in which this project is nested. Table 5 lists the main baseline activities, along with their implementing bodies. Key Programmatic gaps serving as constraints to LME management are highlighted.

TABLE 5: PROJECT-RELATED BASELINE ACTIVITIES

Baseline Activity	Organization/Project/ Programme	Gaps
<u>Oceanographic Assessment</u> Country EEZ based oceanographic research, data and information creation, collection and storage	Government Oceanographic Institutes or oceanographic departments in environment or fisheries ministries	Little or no emphasis on transboundary issues. Very shallow layer of trained oceanographers and limited budgets limit the number of ship cruises and purchase of specialized equipment for non-ship based activities such as GIS based modelling. Limited opportunity for extra-national training. Data and information is nationally based and not generally shared at regional level. Public participation generally not emphasized.
<u>Training</u> (Physical and Chemical Oceanography and related Ecology/ Biology disciplines). Training of oceanographers Training marine scientists	University based oceanographic and marine sciences advanced degree Programmes	With the exception of South Africa, very low enrolments and limited or no oceanographic or marine sciences Programmes offered in curricula. Retention of university trained scientists very difficult. Limited ability for professional advancement (connected to low retention rates).
<u>Applied Research</u> Marine ecology Bio-indicators Ecosystem modelling Fish inventories  Mascarene Plateau	French IRD (THETIS Programme), ECOMAR, IFREMER  Shoals of Capricorn Project (RGS). Training in scientific, practical and marine safety skills, in order to support research	Entry level is large pelagic fisheries giving limited breadth to ecosystem based, LME approach. Limited geographic range of interest across the ASCLMEs due to limited membership of project participating countries. Country and regional capacity building emphasis limited in scope. Data and information not generally available at regional level and more narrowly targeted to tuna and other large pelagic fish. Specific focus on Mauritius and Seychelles rather than region as a whole.
<u>Information Management</u> Establishment and maintenance of marine sciences data and information bases. Electronic access to four main gateways of ocean related information	UN Atlas of the Oceans	Data and information fragmented across institutions. Data sets are not consistent across the region. There is no regional database.  Serves as a repository of selected marine based data and information. No operational capacity in the WIO.
<u>Fisheries Information GIS:</u> Web-based fisheries information system managed by FAO.	FAO, with a Coordination Working Party of IOTC, ICAT, and ISENS	Lacks integration with other regionally based data and information programs.
<u>Integrated Coastal Zone Management (ICZM)</u>	EU IOC/COMESA	No emphasis on offshore areas as needed to ensure LME Data and information will be limited

Baseline Activity	Organization/Project/ Programme	Gaps
Management of marine biodiversity and natural resources Awareness activities in the CZ Regional Training and Excellence Centers Negotiating capacity Pilot CZM projects	National activities in Comoros, Kenya, Madagascar, Mauritius, Seychelles , Tanzania and Somalia; IOWTS and IOGOOS Activities with regional links to Tsunami Alert System.. SIDS Mauritius Strategy, Global Partnership including UNESCO-IOC, ISDR, and ICRI.	primarily to coastal areas and covering coastal marine resources, as will training and public participation initiatives including awareness building.
<u>Pollution Abatement</u>  Coastal zone and EEZ based pollution abatement	Ministries of Environment and related Departments and Agencies	Lack of accurate data baselines to measure relative levels of pollution makes much activity reactive in nature. A shallow layer of trained staff, poor training opportunities, and limited budgets make monitoring and enforcement activity difficult. There is very little interaction among ministry personnel at the regional level, and correspondingly, limited sharing of data sets.
<u>Fishery Management (Stock Assessment)</u> Tuna resource assessment and management including research on and monitoring of stocks, tagging, targeted to tuna and related, large pelagic species	IOTC	Focus is on tuna stocks and no significant emphasis on LME approach.. Participation of several but not all participating countries in the ASCLMEs. No near-shore emphasis. Limited emphasis on country capacity building for LME based investigations. Data and information targeted to tuna and related species. Some data and information likely to be proprietary.
<u>Artisanal Fisheries</u> Improve understanding of small scale fisheries Address destructive fishing practices	Jakarta Mandate (NORAD and IUCN)	No overall emphasis on LME wide science and LME wide management approaches.
<u>Fisheries Management:</u> Improved management of fisheries through institutional capacity building in monitoring, control and surveillance	SADC MCS Programme (EU)	Emphasis limited to fisheries resources. Not all participating countries are members of the SADC thus limited geographic scope. Little data and information collected. Only deals with pelagic fisheries.
<u>Fisheries Management:</u> IOC-ICZM programme	EU/IOTC	Emphasis on coastal fisheries.
<u>Environmental Variability</u> Exploration of causes and effects of coral bleaching and mass mortality of corals in seven countries of the WIO Scattered research on Ocean-atmosphere links and meteorology of the Indian Ocean	CORDIO-SIDA Project	Activities confined to coral reefs and no overall emphasis on LME based management.  Information not codified and available to the region
<u>Conservation of Biodiversity</u> Creation of a participating network of MPAs	WIO-MPA (WWF/FFEM/CI)	Narrow focus on marine and coastal protected areas. Some capacity building but again targeted to MPA personnel. Capacity building and stakeholder



Baseline Activity	Organization/Project/ Programme	Gaps
Creation of a working network of MPA managers		involvement primarily tied to coastal zone related management and resource issues.
<u>Awareness Raising</u> Increase public awareness on related issues Plan and conduct targeted research activities of national and regional importance Disseminate information and data aimed at helping to achieve sustainable use	Marine Science for Management Programme (SIDA) and administered by WIOMSA  Shoals of Capricorn Project (RGS)	Restricted to coastal environment and no significant emphasis or focus on LME wide management issues or the filling of LME wide knowledge gaps.  Project reach limited to Seychelles and Mauritius and limited emphasis on coastal and coral reef based ecology.

32. An earlier version of a TDA was prepared by the UNEP as part of a previous PDF-B for the West Indian Ocean. The TDA was described by the UNEP as very preliminary in nature, and that much remains to be done before a TDA and SAP that meets GEF standards is in place. Notwithstanding the very preliminary nature of the existing TDA, the major threats that were identified during the TDA development process are quite similar to those identified by the ASCLMEs and SWIOFP projects during preparation. The UNEP Preliminary TDA identified the following list of major perceived problems and issues. It included four existing problems/issues:

- a) Shortage and contamination of fresh water;
- b) Decline in harvests of marine and coastal living resources;
- c) Degradation of coastal habitats (mangroves, seagrass beds, and coral reefs), loss of biodiversity; and
- d) Overall water quality decline and contamination of coastal waters, beaches and living resources.

33. Root causes identified in the UNEP driven preliminary TDA were also similar to those that have been identified during preparation by the ASCLMEs and SWIOFP projects, and were as follows:

1. Rapid growth in coastal population and urbanization;
2. Lack of policies and legal framework;
3. Inadequate knowledge;
4. Institutional Weakness;
5. Lack of management strategies; and
6. Inadequate financing mechanisms and support, lack of investments.

34. Elements of this preliminary UNEP TDA will be referenced, updated, and expanded in the overall TDAs assessments to be undertaken as part of the ASCLMEs Programme. The GEF is now providing catalytic support to a revision of this preliminary TDA. A more comprehensive description of the UNEP driven preliminary TDA carried out for the West Indian Ocean can be found in Annex 18 of this document.

### **Barriers to LME Based Management**

35. Under the Baseline Scenario, numerous, but largely fragmented, efforts will be made to improve management of the coastal and marine environments of the ASCLMEs. Despite the number of Programmes underway and planned *inter alia* in the arenas of fisheries management, pollution control and integrated coastal zone management, the scale of action is being outpaced by human-induced threats to the coastal and marine environment. Countries generally lack the absorptive capacities and the financial wherewithal to take these initiatives to scale. A number of regional initiatives are in place, nested in a regional policy framework and growing consensus on the need to work collaboratively to address the suite of threats facing marine ecosystems and their constituent resources. However, these focus heavily on the coastal zones of the participating countries.

Accordingly, current and planned initiatives will not by themselves be sufficient to institute an ecosystem approach to LME management. Given the transboundary nature of many threats, their root causes and effects, the threats to the environment cannot effectively be contained through national and sectoral initiatives alone, and a holistic multi-sectoral regional ecosystem management approach is needed. There are several barriers to ‘mainstreaming’ an LME approach into national and regional management structures and processes which can be listed as follows:

36. **A. Inadequate data for management purposes:** Clearly, there is a strong concern regarding inadequate and insufficient data with which to inform and drive management processes. All of the countries are aware (to a greater or lesser extent) of the need for reliable information from which they can evolve integrated and sustainable marine resource management strategies. The countries are also aware of the need to address transboundary issues in relation to the LMEs and to act decisively, in a cooperative and coordinated manner, in order to better manage and conserve the high biodiversity and economic value of the associated resources. Furthermore, they are acutely conscious of the need to address the significant gaps in knowledge and in on-going data collection and monitoring that is necessary in order to both develop an effective baseline for management, and to drive a dynamic and operational management process. In this respect, it should be noted that the ODINAfrica project, supported by KMFRI in Mombasa, Kenya is beginning to serve a facilitative role with regard to data collection and dissemination as it has begun to:

- Provide Scientists in the Western Indian Ocean Region with bibliographic information;
- Prepare and distribute various data products relevant to marine sciences of the WIO region
- Promote communication between WIO marine scientists and marine scientists globally;
- Publicize marine science of the WIO region and other parts of the world; and
- Provide information equipment, software and training.

37. **B. Lack of regionally based monitoring and information systems and coordination:** To the limited extent multi-country assessment Programmes are underway at regional level (e.g. ACEP with activity related to developing an ecosystem approach to LME management; IOTC for creation of a tuna database), there has been little attempt to aggregate existing data, and little attention has been paid to ensuring the ready accessibility of data by end users to facilitate joint management efforts. There is a major unmet need, identified during project preparation to repatriate data that has been gathered over many years in the WIO by foreign fishing fleets and research vessels. Weak information coordination at regional level reduces the value of the information that has been gathered on ecosystem status. These factors, coupled with the fact that regional institutions have varying numbers of participating countries as members, and have fragmented mandates, present the greatest barriers to adoption of an ecosystem approach to LME management. A data and information workshop convened by the Project showed clearly that existing Programmes and institutions do not possess cross-cutting information at regional scale or, with the exception of South Africa, even across a full range of marine issues at national scale. There is at present no regional Programme or institution with the mandate to create and manage such an integrated and over-arching, regionally based information system which could be accessed by regional stakeholders. Information systems at both national and regional scale are fragmented, poorly described, lacking in synthesis, and generally unavailable to managers even at national scale. What little integrated regional information that there is exists in incompatible formats, is not centrally stored, not synthesized and thus not readily accessible to decision-makers and stakeholders.

38. **C. Lack of national and regional ecosystem level assessment capacity:** A solid understanding of oceanographic, chemical and ecological processes is necessary to manage LMEs. The understanding of energy flow and trophic interactions in marine ecosystems in the WIO is poor and connectivity studies are needed to facilitate management of shared marine resources and systems. Biodiversity patterns and ecosystem processes need to be recognized, understood, and managed effectively in order to maintain ecosystem integrity and to maintain existing, and indeed to develop future, fisheries industries. The WIO region has been the focus of a limited number of oceanographic

related ecosystem assessment efforts; however system wide understanding is rudimentary. Assessments are hampered by a lack of dedicated ship's time, lack of coordination of ship cruises to assess priority knowledge gaps, dearth of trained scientists within the region, and a lack of specialized equipment. Very limited information is available on larval transport, and on the location of spawning grounds and nursery areas.

39. Some information is available on the status of artisanal fisheries but this is very limited and frequently out of date. Its accuracy and reliability may also be questionable as there has never been an effective review and synthesis of such information for the ASCLMEs region. The baseline is characterized by numerous and fragmented national efforts to manage their artisanal and subsistence fisheries, often as part of a larger ICZM Programme or biodiversity management project. However, there is limited pooling of data between countries and the transboundary dimensions of artisanal fisheries, including information on lifecycle aspects (such as spawning, larval transport and nursery areas) remain largely unknown. Poor management, inadequate ecological information and the unknown relationship between resources fluctuations and ocean-atmosphere links present threats to both the sustainable yield for artisanal and subsistence fisheries, and overall biodiversity. Very few of the artisanal fisheries in the participating countries are subject to management and in less than 10% is there any linkage between management and scientific information. There is a general lack of valid up-to-date statistics regarding employment within the artisanal fishing sector. This is further complicated by the lack of an accepted definition for what actually constitutes 'artisanal' fishing. Furthermore, Artisanal fishing tends, to some extent, to be seasonal (being affected by adverse weather conditions) and may also be associated with other employment activities such as farming. This difficulty with collecting reliable information on this sector makes management and monitoring somewhat difficult. Attempts have been made to encourage and organize traditional fishing communities to manage their own resources. While this has proven to be easier in geographically well-defined areas such as lakes and rivers, this is much more difficult and complex along the coast where resources are shared with other stakeholders such as the industrial fleets. These growing industrial fleets are creating tension with the traditional fishermen by taking more of the already overexploited coastal resources and destroying the stationary gear used by some artisanal fishermen. These concerns need to be addressed, to facilitate more comprehensive environmental assessments and thus to address the knowledge gaps hampering management of the LMEs. It should be noted that IOC in cooperation with the European Union is developing a Regional Programme for the Sustainable Management of the Coastal Zones of the Countries in the Indian Ocean. This will be looking at some of the problems of artisanal and subsistence fisheries within the coastal areas of the ASCLMEs and may well be able to provide more up-to-date, reliable data on this sector.

40. A number of workshops have been organized within the past two years in an attempt to document the information that is currently available. This includes a Workshop sponsored by the Royal Society of London in January of 2003 entitled "Atmosphere - Ocean - Ecology Dynamics in the Western Indian Ocean"<sup>21</sup>. In addition, a comprehensive multi-disciplinary review of existing, oceanographic related literature was undertaken during project preparation. The review covered 200

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<sup>21</sup> Presentations and discussions included the following subjects: improving predictions of climatic variability from rainfed agriculture, development of sustainable approaches to the use of marine resources, and the inter-relationships between physical oceanography and ocean productivity. A special session was also conducted on the research that has taken place on the Shoals of Capricorn sponsored by the Royal Society and the Governments of Mauritius and the Seychelles. Research results were presented on seafloor morphology based on one-nautical mile bathymetric mapping, much of it via satellite. Various factors that influence the meteorology of the Indian Ocean were identified. In addition to the dominant cycles of the Asian and Australian Monsoon systems, it was shown that the influence of *El Niño* on WIO meteorology is significant, leading to greater variability and accentuating upwelling in several places. Evidence was presented indicating that land structures, such as the Himalayan Plateau and the East African Highlands have a profound influence on WIO climate patterns. Combined cyclonic and anti-cyclonic eddies, together with the Mozambique eddies, play a role in triggering the shedding of Agulhas Rings into the Atlantic. The importance of circulation patterns around the Mascarene Plateau, as well as the Indonesian "throughflow" were also seen to strongly influence WIO oceanography.

publications, including scientific literature and local reports and grey literature. The review shows clearly that there is a dearth of biophysical information and appropriate empirical data sets compared to other LMEs elsewhere on the globe. There is considerable asymmetry in data coverage across the region. For example, the oceanographic data sets for the continental shelves adjacent to the Agulhas Current are relatively robust. By contrast, *no* appropriate oceanographic data of any kind has been collected for certain shelves off Madagascar. Further, a detailed assessment of available hydrographic, remotely sensed and marine biological data for the ASCLMEs and adjacent region was conducted during preparation<sup>22</sup> and verified through two multi-stakeholder workshops<sup>23</sup>. A number of information gaps were identified and it was concluded there is a need to:

- Identify components of the offshore circulation that affect shelf regions in the West Indian Ocean and thus the distribution of marine organisms and the geographic structure of marine ecosystems.
- Determine the extent to which circulation of the ASCLMEs region plays a critical role in local climate variability and global climate change.
- Provide information on the water characteristics, water quality indexes, and productivity on the shelf regions of the ASCLMEs that have the most marked effects on the cross-boundary ecosystems and thus national and transboundary fish stocks.
- Identify important components of terrestrial run-off that influence coastal ecosystems and their health.
- Identify aspects of the cross-boundary marine ecosystem on the shelves of the West Indian Ocean are most easily disturbed by, most vulnerable to human interference or climate variability.

41. Work undertaken for the Indian Ocean Commission (IOC) on Sustainable Management of the Coastal Zones of the Countries in the Indian Ocean<sup>24</sup> has identified a lack of valid, precise and up-to-date information and statistical data relating to the artisanal and coastal fisheries sector.

42. No organization is currently responsible for regional level capacity building on behalf of the participating countries, as the current array of regional organizations either lack full regional membership, have an insufficient mandate to address regional issues in an ecosystem context, and/or lack the resources to accommodate such a role. In those isolated instances where there are dedicated cruises in the region's national and international waters, information gained is often not shared with the countries and participating countries have generally not received the benefit of ship board training in areas of oceanography and fisheries. A concerted focus on priority management issues is difficult as countries have a shallow layer of qualified people. These gaps will need to be addressed through a structured long-term Programme, aimed at building a cadre of experienced resource managers, and this effort will begin with implementation of the Projects that comprise the ACLMEs Programme..

43. **D. Limited public participation, education and stakeholder involvement opportunities:** Public participation, education and stakeholder involvement Programmes are largely non-existent at regional level. Some national level public participation and education activities through national and donor-funded projects are underway but limited mainly to coastal zone areas. No current institution has the mandate to expand public participation and related activities to regional level and to strengthen regional level capacity to undertake and sustain regionally based public participation activities. A key element to building governmental support for a regional approach to LME management, and thus for SAP approval and execution, will derive from growing public support for the approach. Thus the absence of regionally based public participation and education approaches is a

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<sup>22</sup> R. Roman and J.R.E. Lutjeharms, An inventory of environmental data for the West Indian Ocean. University of Cape Town, 2004

<sup>23</sup> Minutes of the Paarl Workshop, Paarl, SA, May, 2004; Report of the Workshop Titled Towards a Framework for Information Sharing Between Programmes and Countries in the WIO Region, Grahamstown, SA, October 2004.

<sup>24</sup> Landell Mills Ltd. 2004

barrier to realization of this objective. The need for a structured stakeholder awareness Programme is now recognized as a priority by NEPAD.

## **PART II: STRATEGY**

### **THE ECOSYSTEM APPROACH, LARGE MARINE ECOSYSTEMS AND TRANSBOUNDARY ASSESSMENTS**

44. The Convention on Biological Diversity defines 'Ecosystem' to mean a dynamic complex of plant, animal and microorganisms communities and their non-living environment interacting as a functional unit. It further defines the ecosystem approach as a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. It focuses on the essential processes, functions and interactions among organisms and their environment. It recognizes that humans are an integral component of ecosystems. The Conference of Parties to the Convention has endorsed this description of the ecosystem approach, has recommended the application of its principles, and has agreed that the priority at this time should be on facilitating implementation of the approach.

45. The GEF Operational Strategies provide guidance on addressing the need to restore and protect coastal and marine ecosystems. GEF has recommended (Operational Strategy 8) the use of Large Marine Ecosystems (LMEs) and their contributing freshwater basins as the geographic area for integrating changes in sectoral economic activities. Current GEF policy includes stabilizing and reversing fisheries depletion within large marine ecosystems through ecosystem-based approaches.

46. The WSSD Plan of Implementation also encourage the application (by 2010) of the Ecosystem Approach, relating it to the development and facilitation of the use of diverse tools for the elimination of destructive fishing practices, the establishment of marine protected areas, and protection of nursery grounds.

47. Two processes are used by the GEF to engage decision makers, resource managers, the science community and other concerned stakeholders within participating countries in the establishment of ecosystem-based priorities for transboundary issues. These are the Transboundary Diagnostic Analysis (TDA) and the Strategic Action Programme (SAP). The purpose of the TDA is to scale the relative importance of sources, causes and impacts of transboundary waters problems and to identify potential preventive and remedial actions. This should be an objective assessment, based on best available verified scientific and technical information, through full consultation with all stakeholders and technical experts. The SAP enables cooperating nations to jointly determine what policy, legal and/or institutional reforms and investments are necessary to address the TDA priorities.

48. In order for a TDA to be effective in developing a SAP it requires sufficient and accurate data on a multitude of ecosystem-related parameters and issues. Where insufficient information exists then a GEF project needs to undertake necessary assessment and data capture in order to fill the strategic gaps required to affect a TDA. This is particularly pertinent to the ASCLMEs project. There is clearly insufficient data on important ecosystem elements such as productivity, nutrient distribution and fluxes, water quality parameters, larval transport, spawning and nursery areas that may require protection and/or management, artisanal fisheries (in relation to catch effort, sustainability and management needs), and definition of certain critical oceanographic processes that are driving the Agulhas and Somali Current systems that are the foundation of the LMEs. The Project strategy will be to capture and synthesize missing information along with existing information (both repatriated, and within the region) to provide an effective environmental baseline assessment suitably robust to support effective TDA and SAP processes and inform management.

### **THE PROGRAMMATIC APPROACH**

49. The project is part of a Programme entitled the Programme for the Agulhas and Somali

Current Large Marine Ecosystems (ASCLMEs) that will systematically institutionalize an ecosystem-based approach to managing the living resources and environment resources of the ASCLMEs.

50. This project aims to replicate the highly successful approach used by the Benguela Current LME (BCLME) project. BENEFIT (the Benguela Environment Fisheries Interaction and Training Programme) is a regional marine research agency for the three national research institutions of Angola, Namibia and South Africa (three countries of the BCLME Project). BENEFIT was already active in the region prior to the development of the BCLME Project and, in fact, was instrumental in designing and lobbying to get that GEF LME project endorsed and approved. BENEFIT has undertaken much of the requisite scientific data and information necessary for the development of a TDA, and subsequently helped to focus the SAP, which is now being used for regional management of the BCLME. In the ASCLMEs Project there is also a need to capture this requisite data and information to drive the TDA process and to thereby develop the SAP and move the countries closer to LME-based Management approaches.

51. The Programme will facilitate development of a long-term strategy to strengthen cooperative management of the LMEs, based on good science and underpinned by efforts to build capacity at the systemic, institutional and individual levels. An iterative approach is planned, that progressively strengthens management capacities for regional cooperation in addressing transboundary environmental concerns in the LMEs, builds political will and leverages financing. The long-term Programme goal cannot be realized immediately, owing to gaps in essential information, limited absorptive capacities for regional co-management, and the need to build the basis of trust within the region, and between countries and sectors to effect lasting cooperation. Activities planned under the first phase will inform the preparation of a Transboundary Diagnostic Analyzes (TDAs) and Strategic Action Programmes (SAPs) for the ACLME and the southern portion of the SCLME (Kenya and Tanzania), which can be expanded when conditions within the northern portion of the Somali LME, areas in Somalia, become more stable.

52. The first phase includes three inter-linked projects, drawing on the services of the three GEF Implementing Agencies: UNEP, UNDP and the World Bank. UNEP will be addressing land-based sources of pollution and providing TDAs information in that thematic area through its GEF WIO LaB project, while the World Bank will be addressing offshore fisheries (but including coastal commercial crustaceans) and providing TDA material through SWIOFP (South West Indian Ocean Fisheries Project). This approach will ensure a more unified approach to environmental management in the LMEs, drawing on the comparative strengths of each of the agencies. The three Agencies have worked in close collaboration during the preparatory stages of each initiative. Measures have been agreed and institutional arrangements designed to ensure all activities are well integrated, and contribute to the common goal. Annex 5 provides a summary list of the objectives, components and outputs of the SWIOFP and WIO-LaB projects and Annex 6 shows the linkages between the three projects in relation to the LME modules.

53. In order to create a framework for adaptive management, and build capacity necessary to institutionalize an ecosystem approach to marine resource management, the ASCLMEs Project will begin to codify baseline information, and fill priority knowledge gaps needed to prepare the TDAs, and subsequently the SAPs. The ASCLMEs Project will examine the physical, chemical and biological processes, including coastal fisheries, which drive aspects of the LMEs in geographic areas, where information is lacking to finalize the TDAs and SAPs. This work will further establish the baselines against which to measure the success of future adaptive management interventions. It should be noted that the project places what appears to be a disproportionate amount of attention to the Agulhas Current LME. The reason for this is the difficulty in safely accessing large areas of the Somali LME, especially near-shore areas, given the continued political instability in Somalia, which occupies approximately two-thirds of the SCLME coastline. While the project will undertake activity in the boundary areas of the two LMEs (e.g. in the Mascarene Plateau and along the South Equatorial current), and will also undertake assessment work in the Somali upwelling, more definitive work will

have to await the return of conditions that would allow for safe assessments in the Somali LME region. Nonetheless, the TDAs/ SAPs processes will endeavor to address as full a range of issues as possible in both LMEs, and the project will seek to repatriate to the region and collate information on the Somali Current LME, and use other tools, such as satellite altimetry/ GIS to furnish inputs for the TDAs/ SAPs process.

### **THE MODULAR ECOSYSTEM-BASED APPROACH TO LME ASSESSMENT AND MANAGEMENT**

54. The Programme adopts the LME Modular Ecosystem-Based Approach (MA) to management<sup>25</sup>. The approach will be codified within the SAPs, and operationalized during the SAPs implementation phase with funds leveraged from national and international sources. The five modules are listed below in relation to planned project outputs; the matrix delineates individual project responsibilities for the delivery of each module.

**TABLE 6: LINKAGES BETWEEN LME MODULES AND PROJECT RESPONSIBILITIES**

<b>Module</b>	<b>Description</b>	<b>Project Responsibility</b>	<b>Role of ASCLMEs Project</b>
Productivity	Identification of productivity hotspots, trophic relationships, temporal variability, riverine and upwelling inputs, toxic tides and algal blooms, inter and intra systemic linkages, roles of gyres and eddies, and monsoon and atmospheric conditions.	This will be addressed under the ASCLMEs Project.	The ASCLMEs Project through cruises and the purchase of state of the art measuring devices will map productivity hotspots, gather necessary information to gauge temporal variability, and gain understanding of the inter and intra-systemic linkages as needed to inform management decisions at regional level.
Fish and Fisheries	Larval transport, trophic relationships, fishery interdependent surveys, systems functioning and relationship to fisheries, industrial fisheries and their relationship to artisanal and subsistence fisheries, the impact of fisheries on biodiversity, the value of non-consumptive use and the interface with consumptive use, and commercial and subsistence landings and effort.	Implementation of the activities will be shared among the SWIOFP (industrial fisheries), ASCLMEs (artisanal and subsistence fisheries) and WIO-LaB projects.	ASCLMEs Project will contribute information to the SWIOFP project on the issue of larval transport in key currents.
Pollution and Ecosystem Health	Identification of anthropogenic threats, natural perturbation, and the conjunction effects of anthropogenic threats and natural perturbation that relate to	WIO-LaB project with support from ASCLMEs project (Heavy metals and POPs).	The ASCLMEs Project will address issues of pollution through assessment of heavy metal and POPs concentrations in key

<sup>25</sup> A five module strategy is being employed worldwide to provide science-based information for the monitoring, assessment, and management of LMEs. The modules are focused on LME: (1) productivity, (2) fish and fisheries, (3) pollution and health, (4) socioeconomics, and (5) governance.

Module	Description	Project Responsibility	Role of ASCLMEs Project
	ecosystem health.		indicator species. It will also assist WIO-LaB, through cruises, in assessing pollution from land-based sources.
Socio-economic Module	Integrated assessments of human forcing at the LME level and attainment of long-term socio-economic benefits, tasks that are integrated into the outcomes and activities of each of the projects within the PA.	The ASCLMEs and WIO-LaB projects both have activities that address this module, including key elements of the TDA/SAP process and looking at economic benefits at the community level.	The ASCLMEs Project public participation Outcome will involve stakeholders in dialogue about measures to sustain livelihoods while sustaining the long-term productivity of marine resources.
Governance Module	Addresses Regional Governance issues including institutional development, regional and national level capacity building, stakeholder participation, and adaptive management strategies.	This module is also incorporated across the range of outcomes and activities of the three projects, particularly through the TDA/SAP process and associated governance reforms emerging from the SAP.	The ASCLMEs Project will convene representatives of the projects of the Programme, governments, regional organizations and other stakeholders as appropriate to agree on cooperative governance systems for management, as part of the process of finalizing the SAP.

#### PROJECT OBJECTIVE, OUTCOMES AND OUTPUTS/ACTIVITIES

55. The **Programme Goal** is “To ensure the long term sustainability of the living resources of the ASCLMEs through an ecosystem- based approach to management”. Development of TDAs and SAPs for the two LMEs is seen as a critical part of this goal and accordingly is a principal focus in each of the three Projects within the overall Programme.

56. The **Project Objective** is “to undertake an environmental baseline assessment of the Agulhas and Somali Current Large Marine Ecosystems to fill information gaps needed to improve management decision-making, and to ascertain the role of external forcing functions (such as the Mascarene Plateau and the Southern Equatorial Current). This information will be used to develop a TDA and SAP for the ACLME and a TDA for the southern portion of the SCLME”.

57. In line with achieving this **Project Objective**, The **Overall Project Deliverables** are:

- Acquisition of data needed to support an ecosystem-based approach to management of the two LMEs as well as a better understanding of the external forcing functions and linkages to adjacent areas of the Western Indian Ocean region; and
- Full TDAs and SAPs for the Agulhas Current LME and the southern portion of the SCLME (Kenya and Tanzania) adopted at high levels, and a full TDA and SAP for the SCLME to be developed with the inclusion of Somalia when conditions allow.

58. The Project aims to address the Agulhas and the Somali Current LMEs under one initial assessment process as A. this is a more cost-effective approach for GEF and B. the two systems are closely interlinked, unlike many clearly discrete LMEs elsewhere in the world. In fact, the Project also intends to extend the assessment to include the Mascarene Plateau. There is some existing data and further strong evidence that this plateau to the east of Madagascar exerts a considerable influence on both LMEs through its effects on the South Equatorial Current (a primary driver of both the



Agulhas and Somali current systems). Oceanographic cruises within the region can be effectively extended to cover this critically important region without having to commission a separate and more costly initiative. The information from this assessment and data collection phase will, however, be used to develop discrete TDAs and eventually SAPs for the ACLME and the SCLME, and possible help to confirm the presence of a possible Mascarene Plateau LME so as to allow due consideration to be given to initiating a discrete TDA and SAP process for this area at a later date.

59. It is recognized that there may be some difficulties in undertaking the baseline assessment within the northern waters of the Somali Current LME. However, the southern area is accessible and the belief is that work should start were possible to deliver an interim TDA so that essential management strategies can be developed for the waters relating to the East African Coastal Current. At a later date it is hoped that the assessment and TDA can be extended and completed for the northern region and embraced within any existing regional SAP for the southern area of the LME. This will avoid leaving the southern area of the LME unmanaged for an unknown period, to its inevitable detriment.

60. The barriers to ‘mainstreaming’ an LME approach into national and regional management structures (as identified in **the baseline** discussion above), and which now drive the development of the project objectives for this GEF-UNDP assistance initiative, can be summarized as:

- A. Inadequate data for management purposes
- B. Lack of regionally based monitoring and information systems and coordination
- C. Lack of national and regional ecosystem level assessment capacity
- D. Absence of public participation, education and stakeholder involvement schemes

These four barriers provide the justification for the four Project Outcomes listed below

61. The **Project Objective** will be reached through four Outcomes:

<b>Outcome</b>	
<b>1</b>	<i>Key ecosystem assessment and management gaps are filled as necessary to install an ecosystem approach to LME management</i>
<b>2</b>	<i>Decision-making tools are in place, to facilitate the synthesis and application of data for LME management;</i>
<b>3</b>	<i>Regional agreement is reached on transboundary priorities and their root causes and a suite of governance reforms and investments needed to institute a shared ecosystem-based approach to managing the LMEs in support of WSSD targets, and foundational capacities are in place for implementation.</i>
<b>4</b>	<i>A Comprehensive Public Participation Initiative Enables Stakeholders to Engage in Programme activities.</i>

**OUTCOME 1: KEY ECOSYSTEM ASSESSMENT AND MANAGEMENT GAPS ARE FILLED AS NECESSARY TO INSTALL AN ECOSYSTEM APPROACH TO LME MANAGEMENT**

Total Cost: US\$ 19,315,000; Co-Financing: US\$ 13,165,000; GEF Request: US\$ 6,150,000

62. The project will finance a number of environmental assessments to fill critical knowledge gaps within the ASCLMEs in the arenas of physico-chemical oceanography, productivity and biodiversity. This work will describe the inter-relationships between currents, water quality, temperature and other variables in the ASCLMEs. Biodiversity studies will seek to map food webs and biogeography, contribute to knowledge on bio-indicators, and genetics, provide information on larval transport related to nearshore fisheries and biodiversity (fish and crustacean larvae, corals, etc), and map the primary spawning grounds and nursery areas for commercial and threatened marine resources. This information is needed in order to finalize the TDAs, and enable the countries to set priorities for intervention under the LME SAPs, in turn needed to operationalize an ecosystem

approach to the management of the LMEs, It will also contribute to a better understanding of the determinants of environmental variability in the ASCLMEs region. Annex 7 supplies a detailed account and summary of the information gaps that need to be addressed to facilitate LME management.

63. Offshore data will be collected using dedicated research ships, through the deployment of equipment placed on the ocean floor and through the use of drifters and satellites. Eight hundred days of dedicated ships' time will be secured, and additional ships time will be available through SWIOFP (oceanographic data will be collected during fishery cruises in order to ensure cost efficiencies)<sup>26</sup>. Ships will also be deployed and tasked for the purposes of assisting the WIO-LaB project to accomplish its objectives. Nearshore data needs (particularly in relation to larval transport, spawning areas and nursery areas) will be addressed through a review of existing data, identification of critical gaps, and prioritization of activities to address those gaps for the purposes of informing the TDA process as well as developing a baseline for longer term monitoring.

64. The assessments will focus in discrete areas, where information gaps are most acute, and will seek to add to the body of existing environmental information on the LMEs. Assessment activities will be co-financed by the Governments of Norway and France and by the ACEP (African Coelacanth Ecosystem Programme), which will dedicate ships time, technical assistance and specialized equipment.

65. The UNDP ASCLMEs Project will undertake an assessment of the artisanal and subsistence fisheries sector to complement and complete the work that the World Bank SWIOFP project will be undertaking within the industrial fisheries sector. The SWIOFP project generally will limit its activities to beyond the 150 m depth contour and is dealing primarily with blue water fisheries in the high seas, although it will also look at the commercial aspects of the crustacean and mollusc fishery for the region. Clearly there are many gaps with regard to coastal fisheries at the community level, which need to be filled in order to provide a fully regional picture for an ecosystem-based management approach of fisheries *per se*. The UNDP ASCLMEs project will attempt to fill these gaps.

## OUTPUTS/ACTIVITIES

### 1.1 Prioritized ecosystem assessment and management gaps in ecosystemic processes in key geographic areas of the ASCLMEs addressed

66. The project will undertake selected in-field assessments and data collection in order to address specific knowledge gaps within discrete oceanic areas of the ASCLMEs as shown in Table 7<sup>27</sup>., consistent with available resources. The project will further review known information on specific coastal issues directly related to LME management including larval transport and identification/mapping of important spawning grounds and nursery areas for commercial species. The project will also review regional initiatives pertinent to artisanal fishery issues in order to capture information relevant to the LMEs. This will include work undertaken for the Indian Ocean Commission (IOC) on Sustainable Management of the Coastal Zones of the Countries in the Indian Ocean<sup>28</sup>. The IOC initiative in particular will be looking at improving data and information on the artisanal and subsistence fisheries within the ASCLMEs region. Therefore, any efforts by the

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<sup>26</sup> Principal among the ships to be deployed for ASCLMEs based work are the *Dr. Fritjof Nansen*, which will be available to the projects on a cost-shared basis with the Government of Norway and managed by FAO, and the *RS Algoa*, a South African government research vessel made available to the projects in conjunction with the Government of South Africa and through the ongoing, directly related work of the ACEP. Other smaller ships, independently contracted by the ASCLME and SWIOFP, and where possible their capabilities shared between the two projects to maximize efficiencies, will also be deployed.

<sup>27</sup> The information that appears in this Table is a synthesized version of Annex 4??.

<sup>28</sup> Landell Mills Ltd. 2004

currently proposed UNDP-GEF LMEs project should therefore coordinate closely with such an initiative to avoid duplication but to ensure capturing the necessary information to drive the ecosystem approach TDA process.

67. The various strategies and approaches for information capture and analyzes will feed two primary purposes in relation to the project's long-term contribution to LME management - A. It will provide input to the TDA and SAP processes, and B. It will create the national/regional databases necessary to develop the long-term monitoring and assessment for LME management purposes.

**TABLE 7: LIST OF DATA GAPS AND POTENTIAL ASSESSMENT METHODOLOGIES**

<b>Geographic Area: Somali Upwelling and Penetration of Red Sea water in the ASCLMEs</b>	
<u>Data Gaps:</u> Information on environmental variability, upwelling, productivity and related fisheries. Determine how Red Sea water reaches the ASCLMEs to increase understanding of global thermohaline circulation & inter-ocean water exchange	<u>Indicative Assessment Methodology:</u> Cruise of the Nansen or similarly equipped vessel to the Somali Upwelling <sup>29</sup> . Two cruises foreseen.
<b>Geographic Area: Kenya and Tanzania Coasts</b>	
<u>Data Gaps:</u> Mapping needed of inshore circulation patterns. Information needed on larval transport, recruitment, environmental conditions for fisheries, and pollutant dispersal	<u>Indicative Assessment Methodology:</u> Cruises of the Nansen or similarly equipped vessel, and smaller vessels that could be contracted in partnership with SWIOFP and WIO-LaB.
<b>Geographic Area: Southwest Indian Ocean shelf regions</b>	
<u>Data Gaps:</u> Knowledge of shelf circulation patterns and transport of fish larvae, dispersal of pollutants. Information on system productivity needed.	<u>Indicative Assessment Methodology:</u> Two cruises of the Nansen or similarly equipped vessel and work undertaken jointly with SWIOFP. Dispersal pollutants work undertaken in cooperation with WIO-LaB.
<b>Geographic Area: South Equatorial Current</b>	
<u>Data Gaps:</u> Information on the circulation patterns of off shore currents. Productivity and chemical oceanographic assessments.	<u>Indicative Assessment Methodology:</u> Cruises by the Nansen or similarly equipped vessel that could be undertaken in conjunction with the SWIOFP project.
<b>Geographic Area: The splitting of the southern and northern branch of the East Madagascar Current</b>	
<u>Data Gaps:</u> No current information on this area is available. Knowledge of shelf and coastal circulations, biodiversity, chemistry and geology virtually non-existent.	<u>Indicative Assessment Methodology:</u> A cruise by the Nansen or similarly equipped vessel which could be undertaken in conjunction with the SWIOFP project.
<b>Geographic Area: The forcing of the South Madagascar upwelling cell</b>	
<u>Data Gaps:</u> Baseline information on coastal circulations, biodiversity, chemistry and geology.	<u>Indicative Assessment Methodology:</u> A cruise by the Nansen or similarly equipped vessel which could be undertaken in conjunction with the SWIOFP project.
<b>Geographic Area: Mozambique Channel</b>	
<u>Data Gaps:</u> Information needed on the shedding and triggering of Mozambique eddies. Information also needed on productivity	<u>Indicative Assessment Methodology:</u> Cruises could be jointly undertaken by the ASCLMEs Project, SWIOFP, and the ACEP. The Nansen or similar vessel, and Algoa could undertake fisheries surveys through trawls.
<b>Geographic Area: Areas of the Mozambique and SA coasts, including principally the Delagoa eddy, the point at which the Agulhas Current begins to influence shelf circulation off Mozambique and SA, the Natal Pulse, the driving of the St. Lucia and Port Alfred upwelling cells.</b>	
<u>Data Gaps:</u> Information needed on eddies to determine effects on overall ecology of the areas and particularly on downstream biodiversity, influence on shelf circulation, disposition of river outflows, dispersal of	<u>Indicative Assessment Methodology:</u> Cruises could be undertaken jointly by the ASCLMEs Project, SWIOFP, and the ACEP. The Nansen or similar vessel and Algoa could undertake fisheries surveys through trawls.

<sup>29</sup> Security conditions in this area do not allow for such cruises in the near-term. For purposes of the ASCLMEs and SWIOFP Project durations, a synthesis of existing information will be undertaken.

pollutants and thus habitat of organisms, and potential role on health of prawn fisheries;	
<b>Geographic Area: Agulhas Bank</b>	
<u>Data Gaps:</u> Understanding of the hydrodynamics of the Agulhas Bank to enhance existing information on the valuable anchovy and sardine fishery spawning ground which has implications for the health of these fisheries in the Benguela Current LME.	<u>Indicative Assessment Methodology:</u> Placement of current meter moorings at the upwelling and one cruise of the Algoa would be needed as well as a cruise by a vessel similar to the Algoa..
<b>Geographic Area: Mascarene Plateau</b>	
<u>Data Gaps:</u> Information on the interaction of physico-chemical and biological processes in this large, shallow, mid-ocean region. Specific information needed on seagrass beds, overall climatic patterns, variability, and the potential influence of the Indian Equatorial Jet on productivity in the ASCLMEs.	<u>Indicative Assessment Methodology:</u> Two cruises by the Nansen or similarly equipped vessel could be undertaken in conjunction with the SWIOFP project.
<b>Geographic Area: System Wide</b>	
<u>Data Gaps:</u> Improved understanding of the role of the AA-Monsoon on the predictability of the global climate system.	<u>Assessment Approach:</u> The project would partner with the ongoing work of the CLIVAR-Goals project of the WMO/IOC/ICSU World Climate Research Programme.
<b>Geographic Area: Region-Wide (Using indicator species in the Mozambique Channel and Seychelles)</b>	
<u>Data Gaps:</u> No baseline information on loadings in key Indicator species of PTS and POPs.	<u>Assessment Methodology:</u> Analyzes of heavy metal concentrations and POPS
<b>Geographic Area: Region-Wide (mapping larval transport, spawning grounds and nursery/settlement areas)</b>	
<u>Data Gaps:</u> Poor baseline information on the distribution and location of nursery areas, spawning and settlement grounds, and on general larval transport trends and variability along coastlines	<u>Assessment Approach:</u> The project will undertake an assessment of current knowledge on spawning and settlement grounds as well as nursery areas and larval transport. This will identify gaps in relation to the TDA requirements, and develop a strategy for filling those gaps.
<b>Geographic Area: Region-Wide (Distribution and catch effort of Artisanal Fisheries)</b>	
<u>Data Gaps:</u> Inadequate statistics on artisanal catches and landings Poorly coordinated assessments (where available)	<u>Assessment Approach:</u> The project will review all known information on artisanal fisheries around the coastline within the project system boundary to inform the TDA/ SAP formulation process. Mechanism will be identified for filling gaps and to develop long-term community-based monitoring of artisanal fisheries

68. The offshore oceanographic surveying procedures will utilize a towed undulating equipment array deployed from the vessel, along with point-source sondes to collect data.<sup>30</sup> At the desktop level, information will be integrated, through a GIS system, onto satellite imagery. These satellite images will then provide multidimensional maps linking productivity, currents, water quality, air and sea temperatures, and climatic conditions along with seasonal trends. These products will then be available for further refinement through inputs from the other components of this UNDP project (e.g. larval transport and nursery area locations) and from the other projects in the ASCLMEs Programme addressing land-based sources of pollutants and fisheries.

69. In the early stages of Project implementation the Cruise Coordinating Group, in cooperation with the Cruise Coordinator (see **Executing Arrangements**), will develop a strategy and the associated logistics for the oceanographic surveys and cruises. This will be based on a review of the current knowledge and identification of the priority ‘gaps’ that need to be addressed (see Table 7 above, and Annex 7) as well as consideration of the past and on-going initiatives within the region from which appropriate data can be captured. The strategy will also address training needs for regional capacity building and the inclusion of counterpart national and regional experts and specialists. Data analyzes, storage and access will be a further key component linked into Outcome 2

<sup>30</sup> See Annex 7 for details of the planning and strategy for the oceanographic surveys.

(below). Finally, the strategy will identify management applications for the specified data collected as well as identifying targets for the distribution of that data.

### **1.2 Baseline information obtained on persistent organic pollutants (POPs) within the LMEs through the use of key indicator species.**

70. Apex predators and seabirds will be used as indicator species to determine the presence and effects of heavy metals and POPs on overall ecosystem health. This Programme is based on the fact that seabirds are abundant in the ASCLMEs region (>6 million pairs), are marine top predators among the most easy to study at their breeding site and have a foraging ecology highly tied to their marine environment and to surface dwelling tunas. The Programme is ongoing in the Mozambique Channel and should start during the year 2005 in the Seychelles Basin (those two areas gather >90% of the seabird community for the ASCLMEs). The Government of France will finance studies into heavy metal concentrations of mercury, selenium, cadmium, copper, zinc, magnesium, and arsenic in the muscle, liver, and kidney tissue of seabirds and fish, and in the blood and feathers of seabirds. The project will add analyzes of POPs listed under the Stockholm Convention. The resulting information will establish a baseline for long-term monitoring and define management priorities to be addressed through SAP interventions, and result in a cross-Programmatic benefit between the IW and POPs Focal Areas of the GEF.

### **1.3 Key knowledge gaps in near-shore (artisanal) fisheries updated, nursery areas and other biologically rich habitat mapped or otherwise identified using existing information, and key activities defined for inclusion in the TDA and policy needs identified for inclusion in the SAP.**

The 5-module approach that underlies the programmatic approach to the ASCLMEs Programme cannot be considered complete without taking into account the important issue of near-shore (artisanal) fisheries. The SWIOFP project generally will limit its activities to beyond the 150 m depth contour and is dealing primarily with blue water fisheries in the high seas, although it will also look at the commercial aspects of the crustacean and mollusc fishery for the region. Clearly there are many gaps with regard to coastal fisheries at the community level, which need to be filled in order to provide a fully regional picture for an ecosystem-based management approach of fisheries *per se*. The ASCLMEs Project will address these knowledge gaps.

### **1.4 A region wide economic valuation of near-shore and marine goods and services is undertaken to gain a greater understanding of the economic importance of these areas.**

The near-shore resources of the ASCLMEs are crucial to the economies of the countries in the region, and yet the overall economic value of these resources has never been calculated at regional scale. This output/activity would identify the incremental costs and benefits attached to and derived from near-shore fisheries management and environmental protection to the countries individually and to the region as a whole. There would be an assessment of the costs and risks associated with inadequate attention to near-shore fishery management, environmental monitoring and resource protection across the region. And last, there would be a general assessment of the net benefits of joint ecosystem management in the region, and discuss its contribution to broader national and regional development objectives such as food security, poverty alleviation and job creation.

71. Table 8 (below) summarizes the information that would be captured from the assessment process, shows how the information would feed into specific management applications, and how these management applications then link back to the modular ecosystem based approach to LME management. Annex 8 shows the linkages between the various project outputs, the LME modular approach and the funding sources for all three nested projects (UNEP, UNDP and the World Bank) under the Programme for the ASCLMEs.

### **TABLE 8: MANAGEMENT APPLICATIONS FOR NEW INFORMATION ARISING FROM**

**ASSESSMENT PROCESS (INCLUDING LINKS TO LME MODULAR APPROACH)**

<b>NEW INFORMATION FROM ASSESSMENTS</b>	<b>OPERATIONAL MANAGEMENT APPLICATIONS</b>	<b>LINKS TO MODULAR APPROACH</b>
Improved understanding of determinants of productivity in the ASCLMEs	Management of fishing activities in the area.	Productivity Fish and Fisheries
Improved knowledge of transboundary environmental processes associated with the current regimes	Adaptive management schemes governing artisanal fisheries and pollution reduction in the area.	Fish and Fisheries Pollution and Ecosystem Health
Improved understanding of ocean-atmosphere links in the ASCLMEs, which contributes to understanding of global climate processes.	Development of Early Warning Systems and Contingency Planning for Environmental Variability (I.e. ocean acidification, coral bleaching, El Nino events, etc). The information also has utility for inland river basin management activities (Lake Tanganyika, Orange River etc).	Pollution and Ecosystem Health Socio-economic Governance
Information on productivity and larval transport for fish and invertebrates	Development of an ecosystem based approach to fisheries management (e.g. ecosystem-based zonation and development of management/protected areas, etc)	Productivity Fish and Fisheries
Mapping of commercially important nursery areas	Zonation and management of sensitive areas	Fish and Fisheries
Offshore currents need to be better understood as they have bearing on coastal pollution, coral bleaching and productivity.	Information has application for adaptation schemes, pollution control and fisheries.	Productivity Fish and Fisheries Pollution and Ecosystem Health
Establishment of a baseline through analyzes of heavy metal and POPs concentrations in key indicator species.	Future decisions on regulatory measures to be taken regarding heavy metal releases and POPs control	Pollution and Ecosystem Health
Knowledge of cross-boundary shelf and coastal circulations and biodiversity linkages (seeding, migratory patterns, invasive organisms, etc)	Development of a regional management regime to address cross-boundary concerns and transboundary management of living resources (including monitoring)	Governance
Information regarding the Mozambique eddies which carry heat and momentum, and are an unknown component within the global thermohaline circulation. Variations may effect the inter-oceanic water exchange between the Indian and Atlantic Oceans and may have further global implications	Regional and global management responses to environmental variability, especially climate change. Also management implications for larval transport and species migration	Productivity Fish and Fisheries Governance
Information on ecosystem processes on and around the Mascarene Plateau	Determination of whether Mascarene Plateau should be managed as a discrete LME	All LME Modular Areas
Overall improvements to the knowledge of transboundary ecosystem effects and functions	Elaboration of necessary TDA/SAP processes to develop a transboundary management approach for the LMEs	All LME Modular Areas

**Outcome Linkages to SWIOFP and WIO LaB**

In SWIOFP:      Coordination of cruise plans and survey work to ensure cost-effectiveness  
                          Capacity building and training for field scientists at sea

Linkages between artisanal, subsistence and industrial fisheries data to capture interrelationships.

In WIO-LaB: Establishing common methods, quality standards, etc.  
Assessment of training needs and educational Programme requirements  
Linkages to GPA Clearing House

**OUTCOME 2: DECISION-MAKING TOOLS ARE IN PLACE, TO FACILITATE THE SYNTHESIS AND APPLICATION OF DATA FOR LME MANAGEMENT**

Total Cost: US\$3,142,500; Co-Financing: US\$ 1,917,500; GEF Request: US\$1,225,000

72. A coordinated regional framework will be developed to facilitate the acquisition, distillation and dissemination of data on the coastal and marine environments of the ASCLMEs. This will contribute to the NEPAD goal: facilitating collaboration between African countries in the arena of information management. Currently, much valuable data from past research and monitoring remains outside the ASCLMEs region and must be repatriated in order to have utility in the region. The mechanism will facilitate data repatriation, storage, synthesis and retrieval to facilitate applied decision-making in the region on LME management. It is recognized that a number of databases are already functional or are in development within the ASCLMEs region, including those of the ACEP, the FAO Fisheries Information database, IOC-UNESCO, ODINAfrica, the GIS database, and the UNEP Eastern African Coastal and Marine Database. The Project and Programme will ensure compatibility of data sets, and avoid overlaps in efforts to develop databases by combining on existing systems, efforts to synthesize existing and develop new databases will be coordinated among projects within the Programme, the ACEP, and other projects and regional bodies as needed. This issue is addressed further in Annex 16, the Programme Coordination Plan.

**OUTPUTS/ACTIVITIES:**

**2.1 Facilitate the continuing collection, repatriation, synthesis and storage of country and regional data, and the repatriation of extra-regional data and information.**

73. Comprehensive data sets, keys to creation of an effective monitoring and evaluation Programme for the ASCLMEs, will be developed. Attempts to repatriate data is seen as important, particularly fisheries related data. The project will facilitate regional discussions to decide upon the mechanisms for synthesizing country and regional data, and repatriating and incorporating extra-regional information. This will contribute to the design of the monitoring and evaluation component of the SAP. Information focal points will be designated by each country through which the regional project can coordinate national information. The project will assist in development of a regional information clearing house (most probably associated with the Project Coordination Unit, at least in the early stages), which will become part of the long-term regional institutional structure for LME coordination and management.

**2.2 Establish a coordinated plan for assembling and reporting on agreed indicators for monitoring and evaluation of the status of the Agulhas and Somali LMEs.**

74. Monitoring and evaluation systems needed to gauge process, stress reduction, and environmental status trends in the ASCLMEs will be developed. GEF IW M&E process, stress reduction and environmental status indicators have not been applied to any of the country or regional initiatives underway. The project will drive a participatory effort to develop a suite of stress reduction indicators (SRIs) and environmental status indicators (ESIs) to be employed during SAP implementation<sup>31</sup>. These will provide a basis for monitoring results during implementation<sup>32</sup>.

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<sup>31</sup> The project will employ among other things, GEF IW Process, Stress Reduction, and Environmental Status indicators. PIs are already substantially developed and are included in the project logframe analysis.

## 2.3 Increased systems knowledge through use of GIS and predictive models.

75. GIS and remote sensing tools will be developed as decision-making aids. Interventions include the establishment of a formalized network of information managers to support the integration of a regional GIS. This network will be responsible for sourcing information, and would draw up a plan of action for GIS training in each of the countries. The project will provide funding to establish a shared GIS for the ASCLMEs. Activities include research, data mining, data digitizing, data formatting, and data integration. The GIS will be used to undertake a spatial environmental assessment to provide an indication of priority areas for management intervention<sup>33</sup>

### **Outcome Linkages to SWIOFP and WIO LaB**

In SWIOFP: Data gap analysis and data archiving: Establishment of regional data management system.

Baseline assessment: GIS mapping of key species, assessments of marine biodiversity as alternative sources of income and identification of bio-indicator species and relationships between target species and ecosystem health (this will need to be associated with corresponding oceanographic indicators during the TDA/SAP process). This SWIOFP subcomponent will be shared with the ASCLMEs.

In WIO-LaB: Database management and decision-support systems.

Monitoring strategies

Development of Performance Indicators

**OUTCOME 3: REGIONAL AGREEMENT IS REACHED ON TRANSBOUNDARY PRIORITIES AND THEIR ROOT CAUSES AND A SUITE OF GOVERNANCE REFORMS AND INVESTMENTS TO INSTITUTE A SHARED ECOSYSTEM-BASED APPROACH TO MANAGING THE LMES IN SUPPORT OF WSSD TARGETS, AND FOUNDATIONAL CAPACITIES ARE IN PLACE FOR IMPLEMENTATION.**

Total Cost US\$5,746,500; Co-financing: US\$2,421,500; GEF Request: US\$3,325,000

### **OUTPUTS/ACTIVITIES:**

#### **3.1 Financial resources brokered to ensure the financial sustainability of information systems.**

76. The project will dedicate resources to identify financial sources and revenue generating mechanisms within countries and at the regional level (including fishery levies) to sustain the ASCLMEs Programme-based environmental information system, and provide the financial framework for the implementation of environmental assessment, information management and stakeholder participation activities spearheaded under the SAP. The project, in cooperation with SWIOFP, WIO-LaB and ACEP, will also undertake an assessment of ecosystem and related function values and demonstrate the cost-effective advantages of cooperative LME-based management approaches as per the SAPs. This should act to encourage policy-level decision makers to buy-in to the project in the realization that not to do so would be economically risky and could lose revenues over the mid-to short-term.

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<sup>32</sup> The M&E strategy is being fine-tuned and will be finalised during project appraisal. The final strategy will be circulated at the time of CEO endorsement.

<sup>33</sup> For instance, areas of high biodiversity value and areas vulnerable to pollution from land based and marine sources.



### **3.2 Institutional, Programme and human capacity building requirements are identified and addressed through training initiatives.**

77. In its early implementation stages the Project will identify training needs in conjunction with SWIOFP. A Capacity Building and Training Programme will be drawn up as a ‘Needs Assessment’ exercise and will guide ensuing training activities geared to improving institutional and individual capacities for LME assessments, information management and other related disciplines. The training courses will include activities not only to empower local specialists to engage in the TDA and SAP processes (such as the recently completed Train-Sea-Coast course on the TDA-SAP approach), but also to build regional capacities for monitoring processes, and for evaluating process, stress reduction and environmental status information. Overall capacity building and training needs for the project lifetime will be elaborated into a CB&T Programme (also early in Project Implementation) based on this needs assessment. This CB&T Programme will also include the CB&T inputs from the Oceanographic Surveys Strategy (see Annex 9). This Programme will identify CB&T needs, appropriate institutes, available personnel, various levels of CB&T, counter-parting options, sustainability of capacity building, ‘train-and-retain’ mechanisms, etc. Progress with the CB&T Programme will be reviewed through the standard project monitoring and evaluation processes (see M&E Plan) as well as at each meeting of the Project Steering Committee.

### **3.3 Close and regularized communication established among the IAs, the various Projects under the Programme, and other related projects and institutions in the region.**

78. The project will assure a well-defined, adequately funded and functioning set of coordination and communication mechanisms among the GEF IAs, the participating countries, and stakeholders. The principal output of this activity will be creation and functioning of a Programme Coordination Committee (PCC) to assure effective synergies between projects<sup>34</sup>.

### **3.4 Linkages with other GEF supported LME projects in Sub-Saharan Africa and globally are established.**

79. Exchanges of country personnel involved in the project with other GEF IW projects in Sub-Saharan Africa and in other regions will be undertaken to assure the cross fertilization of good practices. The project will also facilitate the attendance of key project and other expert resources from the region to such events as the biennial IW conferences and other workshops as a means of building their capacities. Negotiations are currently underway to confirm the role of NEPAD as the coordination focal point for African LMEs. Once confirmed it is expected that a suitable website will be developed at Programme level and made accessible to all African LME stakeholders (and indeed all LME stakeholders globally). A representative of the NEPAD is on the Project Steering Committee, and discussions are ongoing to determine the more precise roles that the NEPAD can assume during Project implementation.

### **3.5 TDAs and SAPs finalized.**

80. The TDA and SAP<sup>35</sup> processes will be carefully coordinated between the three projects, as they are seen to be the most important product that will come of the programmatic approach. It is recognized that the implementation periods of the three projects do not correspond. In order to fit respective project implementation timeframes, and in particular within the light of the already ongoing WIO-LaB project, the combined workplan for completion should lead to a December 2008

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<sup>34</sup> A detailed coordination plan is being finalised defining the arrangements. This will be circulated at the time of CEO endorsement.

<sup>35</sup> The 3 GEF Projects within the Programme will produce two TDAs and two SAPs. One TDA and one SAP will be developed for the countries of the ALME; and one TDA and one SAP for the southern reach of the SLME (Tanzania and Kenya), as the coastal areas of Somalia, and Somali near-shore waters are not at this time considered safe areas by the UN for Project and Programme work.

deadline for completion of a preliminary, WIO-LaB specific TDA and SAP<sup>36</sup>. Completion of this first stage will enable detailing and start of SAP implementation activities to be started under the pollution and ecosystem health module. By December 2008, data from cruises and other activities under SWIOFP and ASCLME will largely not yet be available, and thus ecosystem-wide TDAs/SAPs will not be produced until closer to the completion dates of the ASCLMEs and SWIOFP Projects, scheduled for completion in 2011. The 2008 WIO-LaB specific TDA will, however, include an assessment of available data and information pertinent to the ASCLMEs and SWIOFP Projects.

81. Each of the Projects within the Programme will be responsible for developing its portion of the TDAs – the WIO-LaB for land-based activities/sources and their impacts, the SWIOFP for off-shore fisheries, and the ASCLMEs Project for issues related to productivity, oceanography, near-shore fisheries, and socio-economics. The WIO-LaB Project Manager will take responsibility for management of the TDA/SAP process until 2008, at which time the ASCLMEs Project will provide a Coordinator to assume responsibility from thereon. The Coordinators will work through the Programme Coordination Committee as a way of maximizing necessary levels of communication and cooperation among the three Projects. The principal role of the Programme level Coordinators will be to synthesize the various elements of the TDAs being prepared by the Projects under the Programme. The Coordinator will also be responsible for harmonizing efforts in SAPs preparation.

82. At national level, TDA/SAP committees will be established. These committees will provide country specific inputs to and validate the country level inputs to the TDAs/SAPs. National TDA/SAP committees, and related task forces and work groups, will be comprised of personnel from key ministries and other organizations as deemed necessary by the designated country Lead Agencies. These will comprise at a minimum the focal point institutions of the three projects, expanded with other key stakeholders as necessary. WIO-LaB has already established such national committees for LBA related activities, and these core units will be expanded to encompass the ASCLMEs and SWIOFP projects.

83. To coordinate the work of the national coordination committees, a secretariat function will be established in the designated focal point institution. The Nairobi Convention NFP Institute could assume this responsibility as they are already mandated as coordination centers on marine and coastal environment issues in the participating countries. Each country would, however, make this determination.

84. Each national secretariat and its functioning will be supported by the projects as required, and it is expected that secretariat assistance will be negotiated at Programme level with each participating country, as national level resources and needs differ widely among the participating countries.

#### **Outcome Linkages to SWIOFP and WIO LaB (Further Delineated in Annex 18)**

- In SWIOFP: Fisheries related TDAs and SAPs inputs  
Strengthening the regional management structure.  
Development of the longer-term resource management model that accommodates a revenue-generating scheme based on the use of EEZ marine resources in an environmentally and socially sustainable way.
- In WIO-LaB: Administer national level TDA inputs during 2006-2008  
Identify TDAs and SAPs inputs centered on preparation of land-based activities/sources and impacts  
Determine and satisfy training needs in the region in cooperation with ASCLMEs and SWIOFP  
Review legal frameworks for dealing with land-based activities/sources and

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<sup>36</sup> Apart from meeting the WIO-LaB workplan, this target is being set among others to meet the date of the 2009 Ministerial-level Conference of Parties to the Nairobi Convention, which will be used as a modality for ministerial-level endorsement of the (preliminary) TDA/SAP.

generally through use of the Nairobi Convention mechanism

#### **OUTCOME 4: A COMPREHENSIVE PUBLIC PARTICIPATION INITIATIVE ENABLES STAKEHOLDERS TO ENGAGE IN PROGRAMME ACTIVITIES**

Total cost: US\$3,327,500 Co-financing: US\$1,827,500; GEF Request: US\$1,500,000

##### **OUTPUTS/ACTIVITIES:**

#### **4.1 A Distance Learning and Information Sharing Tool (DLIST) is developed and piloted**

85. The project will pilot an interactive electronic information sharing system, known as DLIST<sup>37</sup> which will provide a web based platform for disseminating information on marine and coastal management issues to a broad array of stakeholders (particularly at the local level). The system will engender a two-way flow of information from end users of information to data providers and vice versa, ensuring that it is demand driven. A help function will be established for this purpose, allowing stakeholders to pose queries to managers and scientists. It will provide a mechanism for sharing information collected through the various assessments undertaken by the three ASCLMEs projects to a large constituency. All project reports and scientific studies will routinely be made available in formats accessible to end users (i.e. information digests available in English, French and Portuguese). The platform will provide space for stakeholders to discuss the assessments and share information. This will provide a vital mechanism for engendering broad based stakeholder participation in the SAP preparation process, and inculcating a sense of regional ownership. A pilot Distance Learning course will be developed, dealing with coastal and marine management issues specific to the ASCLMEs, to enable coastal players to more systematically improve their capabilities. DLIST aims to demonstrate how local communities can generate sustainable livelihoods once they gain access (and are empowered by) information and knowledge on coastal and marine resources. It connects coastal stakeholders with grass root solutions and local knowledge. DLIST is also transforming conservation by providing local communities with the knowledge and tools necessary to value and benefit biodiversity. DLIST has recently published an 'assessment of how Coastal Communities can become involved and benefit from the BCLME Programme'. While this will provide a template for DLIST's contribution to the ASCLMEs Programme, it is recognized that the ASCLMEs Project will require a modified approach given the significantly greater extent to which near-shore resources in the ASCLMEs are of importance to coastal stakeholders and for purposes of country efforts to achieve food security and poverty alleviation. Further information on how DLIST can reach out to communities can be found on the website at [www.dlist.org](http://www.dlist.org).

#### **4.2 A set of public involvement, participation, and environmental education initiatives are developed and implemented in the region.**

86. Activities will include: development of networking opportunities between environmental education practitioners; development of resource materials on marine related topics sensitive to the social and cultural milieu; and the provision of targeted training opportunities for environmental educators; and execution of a media outreach drive in the region, in English, French and Portuguese. The Project will also organize and host a Partnership Symposium in the second half of the project lifecycle. The purpose of this Symposium will be to highlight the achievements of all 3 sister projects under the Programme umbrella for the ASCLMEs, to identify next steps in relation to operationalizing the SAPs, developing management approaches, and continuing to monitor selected indicators and

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<sup>37</sup> DLIST was first piloted along the coastline of South –western Africa, including South Africa, Namibia and Angola, where it is playing a critical role in connecting coastal stakeholders and role players to the activities of the GEF Benguela Current LME Programme. The initiative was developed as an activity of IW LEARN, the International Waters Learning Exchange and Resource Network through the World Bank Group and Eco Africa, a South African based non-government company. The DLIST activity for the ASCLMEs will be implemented by EcoAfrica.

parameters necessary to sustainably guide ecosystem-based management and policy in the region. This Symposium will also help to develop the necessary working relationships with and between public and private sector partners and NGOs which will be crucial to the implementation of the SAP.

### **Outcome Linkages to SWIOFP and WIO LaB**

- In SWIOFP: Stakeholders from all member countries are participating in the project, including fisheries-related ministries, research institutes and associations, fisheries operators or processors, NGOs and local communities
- In WIO-LaB: Develop educational Programmes at all levels  
Develop regional/governmental/private sector/ public sector partnerships

### **INTER-LINKAGES BETWEEN PROGRAMME INTERVENTIONS**

87. Specific interlinkages between the GEF UNDP ASCLMEs project, the SWIOFP and WIO-LaB are identified at the end of each **Outcome** description above. In addition, the three projects will be cooperating closely in regard to development of the TDAs, development of regional management strategies at the ecosystem level, coordination of field-work, training and capacity building, and stakeholder participation. Annex 5 provides a summary list of the objectives, components and outputs of the SWIOFP and WIO-LaB projects.

88. The SWIOFP regional PMU will have some functions in common with its sister project, the ASCLMEs Project, which will allow cost-sharing between these two ASCLMEs components. The two projects have been designed to be complementary, with data and activities generated from one project feeding into and impacting the objectives, activities and outputs of the other. The harmonized implementation structure agreed to by both the ASCLMEs and SWIOFP Project preparation teams includes shared staffing whereby both Projects would take advantage of the ASCLMEs Cruise Coordinator and the Information Systems Officer. In addition, the two projects have agreed to joint planning arrangements, and will hold their detailed Annual Work Programme meetings together. There will also be a common ASCLMEs Programme Coordination Committee (PCC) to help assure that a programmatic approach will be taken within the ASCLMEs. The PCC would be comprised of the respective task team leaders for the IAs, Project Managers, and two members from each of the respective Project Steering Committees.

89. The projects within the Programme have also been analyzed in relation to the overall “fit” of all activities of the three projects, and in relation to specific modules of the LME approach to management (See Annex 8). Further, the TDAs and SAPs processes will be carefully coordinated between the three projects with ASCLMEs Project taking ultimate responsibility for finalizing TDAs and SAPs for the ecosystem approach within each LME.

90. The SWIOFP project will provide inputs on industrial fisheries to the TDAs and SAPs. More specifically, the contribution of the SWIOFP to the TDA and SAP will be differentiation between major environmental and anthropogenic factors that impact migratory and shared fish resources, the establishment of a baseline for key fish species, estimates of commercial fishing pressure and the evaluation of the impact of fisheries on marine resources as a whole.

91. WIO-LaB will be providing the ASCLMEs Project the necessary TDA/SAP elements relating to land-based sources of pollutants for UNDP to eventually incorporate into an overall TDA/SAP for each LME, as relevant. It is recognized that the implementation periods of the three projects do not correspond. In order to fit respective project implementation timeframes, and in particular within the light of the already ongoing WIO-LaB project, the combined workplan for completion should lead to

a December 2008 deadline for completion of a preliminary, WIO-LaB specific TDA and SAP<sup>38</sup>. Completion of this first stage will enable detailing and start of SAP implementation activities to be started under the pollution and ecosystem health module. By December 2008, data from cruises and other activities under SWIOFP and ASCLME will largely not yet be available, and thus ecosystem-wide TDAs/SAPs will not be produced until closer to the completion dates of the ASCLMEs and SWIOFP Projects, scheduled for completion in 2011. The 2008 WIO-LaB specific TDA will, however, include an assessment of available data and information pertinent to the ASCLMEs and SWIOFP Projects. WIO-LaB will also be responsible for coordination of Programme level TDA inputs over the period 2006-2008, at which time the ASCLMEs will provide the continuing inputs through the remainder of ASCLMEs and SWIOFP implementation. It is expected that the Nairobi Convention will play an instrumental role in SAP development and implementation.

92. Further and more specific information on the details of each Project's responsibility in relation to TDAs/SAPs preparation can be found in Annex 16, the Programme Coordination Plan.

93. A unique Project feature is the extent of partnership activities that will be undertaken with the African Coelacanth Ecosystem Programme, or ACEP. ACEP is an African Regional Flagship programme run by a consortium of institutions, including universities and technikons, research organizations, government departments, museums, aquaria, Non-Government Organizations (NGOs), government and non-government conservation organizations within, Comoros, Kenya, Madagascar, Mauritius Mozambique, Seychelles, South Africa and. The African partnerships are fully in accord with NEPAD principles. ACEP is now a recognized NEPAD programme under the CosMar portfolio.

94. ACEP also has partner organizations in the corporate sector and internationally beyond Africa (Belgium, Canada, Germany, Japan, Singapore, United Kingdom, and the United States). All partners contribute to the funding of this multidisciplinary project, though currently the bulk of the funding is provided by the South African Government.

95. In each partner country in Africa, ACEP has a National Management Committee, comprising members from universities, research organizations, government departments that conduct research, and research based NGOs. The programme is guided overall by a Regional Management Committee, on which all partner countries are represented, and ACEP is coordinated by its secretariat within the South African Institute for Aquatic Biodiversity (SAIAB).

96. The close collaboration, which in many instances will be a virtual merger, will benefit ASCLME by providing access to three and a half years of data, information, regional teambuilding and experience. Not only are the benefits to be measured in terms of scientific input, but ACEP has also conducted an evaluation of the capacity building needs of the region in all of the disciplines of interest to ASCLME and is prepared to make its capacity building plan available to ASCLME as a combined thrust. ACEP's progress in terms of data sharing and GIS, and its environmental education and public awareness programmes are well advanced, having produced over 300 publications, nine films and nearly 50 radio and TV interviews. ACEP also has the greatest ship-board experience of any programme in the region, which once again will be made available to ASCLME. Perhaps ACEP's greatest achievement is in building regional goodwill and collaboration, having identified key people and institutions in each country who actively wish to participate in regional marine science initiatives. The harmonization of the two programmes would make this hard-won asset immediately available to ASCLME.

97. At a meeting in Maputo in January 2005 it was recognized that there was a need to harmonize the major regional projects within the Western Indian Ocean (WIO). In an analysis of the contributions of each project to an understanding of the processes of the WIO, it was recognized that

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<sup>38</sup> Apart from meeting the WIO-LaB workplan, this target is being set among others to meet the date of the 2009 Ministerial-level Conference of Parties to the Nairobi Convention, which will be used as a modality for ministerial-level endorsement of the (preliminary) TDA/SAP.

the greatest degree of “potential synergies are between the ACEP and ASCLMEs Project. It has been agreed that the projects will collaborate to use shared resources to collectively achieve more for the region than would be the case if the two projects were to operate independently.” A more detailed explanation of the synergies that exist between the ACEP and the ASCLMEs Project and Programme, and detailed information on the important and related activities of the ACEP is detailed in Annex 19.

## Risks

98. The risks confronting the project were evaluated during the project preparation stage, and risk mitigation measures have been internalized into the design of the project. Five risks have been identified and are discussed in detail in Table 9 below. Assumptions are elaborated in the Logical Framework for the Objective and Outcomes.

**TABLE 9: RISK AND RISK MITIGATION MEASURES**

<b>Risk</b>		<b>Risk Mitigation Measure</b>
Conflict between coastal states with different political agendas results in an inability of countries participating in regional activities to cooperate at the level needed to achieve results.	L	All participating countries are taking steps to strengthen collaboration in managing shared marine resources. A number of regional protocols and Programmes are in place, including the IOC, IOTC, SADC, NEPAD, the Nairobi Convention, and the emerging SWIOFC. The ASCLMEs project, WIO-LaB, and SWIOFP will include activities that allow close liaison with regional Programmes. Close Programmatic links will be established with NEPAD through the NEPAD Coastal and Marine Programmes Coordination Unit.
Pressing domestic economic and social issues such as poverty and human health issues imply that regional environmental concerns receive sub-optimal attention and investment.	S	Countries have already accepted, through their endorsement of the ASLME Programme, through their ratification of the Nairobi Convention and their participation in regional Programmes, an understanding of the links between ecosystem health, food security, and the over-arching challenge of poverty alleviation. The dependence of coastal populations on marine resources for subsistence and income generation, amplifies the importance of maintaining the ecological integrity of the LMEs. The Programme and Project will establish applied information management systems, to inform decision makers of the relationships between environmental variability in the LMEs and economic welfare. The TDAs will chart the causes and effects of threats to each of the LMEs, enabling decision makers to gain a better understanding of the links between socio-economic and ecological systems. The domestic benefits/ costs of regional action/ inaction will be established during SAP preparation in order to build political support.
There will be insufficient numbers of regionally based, trained oceanographers and other experts to fulfil training needs necessary to build individual capacities in the region.	S	Capacity-building requirements will be assessed through as part of the development of a Capacity Building & Training Programme to be developed jointly by the ASCLMEs/SWIOFP Projects. The assessment will take into consideration existing expertise and capacity needs within regional Centers of Excellence. Institutions that can address regional training needs will be identified and their capacity to undertake training strengthened. Links will be established with international centers of excellence (Norway/ France/ USA/ UK), to support this effort.
Participating countries will not be able to agree on the mechanisms necessary to achieve sustainability.	L	A number of regional organizations currently exist and already perform some of the functions necessary to ensure sustainability. The Nairobi Convention will play an instrumental role within this context. Mechanisms to guarantee the financial and institutional sustainability of LME management interventions will be incorporated into the SAP. The ASCLMEs Programme will partly underwrite the transactions costs associated with the requisite discussion/negotiations leading to agreement on these mechanisms. The planned economic assessments will underscore the benefits of regional cooperation to countries over the long-term.
Important local level stakeholders (artisanal fishers, others) will see ecosystem based management efforts as being detrimental to their interests,	M	The DLIST Programme and additional public participation initiatives led by the Projects within the Programme, ACEP, the countries, and regional organizations will serve to build community support. DLIST will provide a mechanism for community outreach, allowing a two-way flow of

Risk		Risk Mitigation Measure
jeopardizing their application at local scale.		information from communities to resource managers. Information will be disseminated using locally appropriate tools (i.e. radio)
<b>Overall Rating</b>	<b>M</b>	Risk Rating: L - Low; M – Medium; S – Substantial

## EXPECTED GLOBAL, NATIONAL AND LOCAL BENEFITS

99. The ASCLMEs harbor biodiversity of global significance, characterized by high regional endemism. Moreover, the region sustains the World’s second largest tuna industry, and there is mounting evidence that the tuna stocks are at risk of being over-fished and thus declining. Finally, the ASCLMEs place a critical, though yet not fully understood role in global climate regulation, and the ocean–atmosphere interface regulates weather patterns, including the Monsoons. The ASCLMEs thus supply a number of ecological goods and services to the global community. These stand threatened by human induced pressures, including increased fishing effort and anthropogenic climate change, the regional consequences of which will be sizable. As the genesis of these threats is transboundary in nature, they cannot be effectively abated through stand-alone national initiatives and there is a need for concerted regional responses. The main global benefit of the project is enhanced understanding of LME functioning necessary as input to LME management through TDA/SAP processes. Global benefits at Programme level will be secured through the institution of a regional ecosystem management framework, allowing countries to strengthen management of living marine resources, and address land based and marine pollution. Over the long term, the overall result of the suite of interventions planned will be to reduce coastal pollution, restore damaged habitats, prevent fish stock collapses, and recover depleted stocks. While these benefits will only be secured once the management framework is functional, the project will make an important contribution to their realization by putting in place building blocks: information systems, capacities and mechanisms to ensure stakeholder participation. Second, enhanced knowledge of the oceanography of the ASCLMEs will assist countries on the Indian Ocean rim to adapt to climate change. Uncertainty regarding ocean-atmosphere links is presently shackling such national efforts<sup>39</sup>.

100. At the national level, the Programme will also assist participating countries to meet the Millennium Development Goals, in particular MDG #1, Eradicate Poverty and Hunger, and MDG #7: Ensure Environmental Sustainability and MDG#8: Develop a Global Partnership for Development. By helping to assure the sustainability of subsistence and artisanal fisheries, the project will contribute directly to poverty prevention. For the large majority of households involved in fishing activities (full-time or occasional fishers) in the ASCLMEs, fishing and related activities do not generate high economic returns but instead help them to sustain their livelihoods and prevent them from falling deeper into deprivation. Small-scale fisheries provide a safety net when the head of a household loses his or her job or when crops fail or when the local economy deteriorates. The recent drought in Southern Africa has had a pronounced impact on crops and local economies. Civil wars, coup-d’etats and natural disasters in the region have in the past, disrupted economic activity, including tourism, and created circumstances where those affected turned to fisheries as an alternative source of income, or to provide food security. The ability of the sector to provide a social safety net is threatened by over exploitation of fish stocks, pollution and habitat degradation (especially of coral reefs,

<sup>39</sup> The Asian-Australian (AA) monsoon affects the livelihood of more than 60% of humanity. Better predictions of the monsoon will greatly benefit the social and economic well-being of this large segment of the world's population. There is strong linkage of the AA monsoon system to the global climate system, and thus improved understanding and prediction of the AA monsoon is not only crucial to the WIO countries but to the world as a whole. Past studies have shown that the AA-monsoon is linked to inter-annual variability of the tropical ocean-atmosphere system, such as the El Niño Southern Oscillation (ENSO) and the tropical biennial oscillation, and other studies suggest that the AA-monsoon may strongly impact the climate outside the monsoon region, including extra-tropical North America. Indeed, a primary goal of the CLIVAR-GOALS project of the WMO/IOC/ICSU World Climate Research Programme is to better understand “. . . the role of the AA-monsoon on the predictability of the global climate system, in particular those parts related to ENSO.” Efforts will be to cultivate a close working relationship with CLIVAR during implementation, to the mutual benefit of the Programmes.

mangroves and sea grass beds). The Programme will play a key role in ensuring the future sustainability of the fisheries sectors. MDG 7 will be satisfied by building foundational capacities and putting in place Strategic Action Programmes, to address transboundary environmental concerns in the LMEs through ecosystem-based approaches. MDG 8 will be addressed by addressing the needs of Small Island Developing States, through the Programme of Action for the Sustainable Development of Small Island Developing States.

101. The WSSD Plan of Implementation makes several references that relate to LMEs and marine resources. Those that are particularly pertinent to the ASCLMEs Project are listed as follows:

- Encourage the application by 2010 of the ecosystem approach, noting the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem and decision V/6 of the Conference of Parties to the Convention on Biological Diversity;
- Promote integrated, multidisciplinary and multisectoral coastal and ocean management at the national level and encourage and assist coastal States in developing ocean policies and mechanism on integrated coastal management;
- Assist developing countries in coordinating policies at Programmes at the regional and subregional levels aimed at the conservation and sustainable management of fisheries resources and implement integrated coastal activities and, where appropriate, the development of related infrastructures;
- Strengthen donor coordination and partnerships between international financial institutions, bilateral agencies and other relevant stakeholders to enable developing countries, in particular the least developed countries and small island developing States and countries with economies in transition, to develop their national, regional and subregional capacities for infrastructure and integrated management and the sustainable use of fisheries;
- Maintain the productivity and biodiversity of important and vulnerable marine and coastal areas, including in areas within and beyond national jurisdiction;
- Develop and facilitate the use of diverse approaches and tools, including the ecosystem approach, the elimination of destructive fishing practices, the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012 and time/area closures for the protection of nursery grounds and periods, proper coastal land use and watershed planning and integration of marine and coastal area management into key sectors;
- Improve the scientific understanding and assessment of marine and coastal ecosystems as a fundamental basis for sound decision-making.

102. It is well established that the ASCLMEs are some of the most dynamically varying LMEs on Earth<sup>40</sup>. An important objective of the Project is to help establish the reasons for and implications of the very significant levels of *environmental variability* evident in these two LMEs. The project will play a major role in assisting countries to assess vulnerability to and cope with environmental variability, especially that caused by anthropogenic climate change. This is expected over the longer term, to have significant benefits for the agricultural sectors, and will assist countries to improve food security and predict and cope with drought. The region is particularly prone to drought, which can have profound consequences on local economies. Rained agricultural production constitutes about 90% of GDP for many African countries and crop yields can vary ten-fold from year-to-year; many water distribution systems in African countries fail during multiyear droughts. Thus the ability to predict drought will be critical to elevating the development prospects of many countries within the ASCLMEs region and beyond.

103. Finally the damage being wrought on coral reefs by rising sea surface temperatures is a major

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<sup>40</sup> A. Bakun, S. Lluch-Cota and C. Roy. 1998. Coastal upwelling and other processes regulating ecosystem productivity and fish production in the western Indian Ocean. p. 103-141. In: K. Sherman, E. Okemwa and M. Ntiba, (eds.) Large Marine Ecosystems of the Indian Ocean: Assessment, Sustainability, and Management. Blackwell Science Inc. Malden, MA. USA.



threat to food security, and the growing nature tourism industry. However, not all coral reefs are equally affected by this phenomenon, and areas affected by upwelling cells, for instance, are likely to be less prone to coral beaching and mortality. The ability to protect these areas, however, is compromised by a dearth of information on the dynamics of currents and upwelling cells. By helping to fill data gaps, the project will enable countries to take responsive measures to ensure that such refugia are well protected.

## **COUNTRY OWNERSHIP, COUNTRY ELIGIBILITY AND COUNTRY DRIVENNESS**

### *Country Eligibility*

104. As recipients of UNDP technical assistance, the participating countries are eligible for GEF funding under para. 9 (b) of the GEF Instrument. Furthermore, planned interventions meet the eligibility criteria for GEF sponsorship inscribed in the GEF Operational Strategy for International Waters, Operational Programme 8: Waterbody-based Programme and Strategic Priorities for GEF finance. The Operational Strategy will be realized by building capacities amongst a group of countries to plan, implement and adapt a suite of measures to protect the transboundary ASCLMEs. GEF finance will offset the incremental costs of a) establishing a common understanding of the environmental problems manifest in the ASCLMEs, and their complex determinants; b) building capacity in the region to address these problems; and c) reinforcing political will to implement and sustain a common Programme of action. The Programme will provide resources for the preparation of comprehensive TDAs and SAPs for the Agulhas and Somali LMEs. These will be key Outcomes of the three projects, each focused on generating information and commitments in their respective areas of focus. In addition, steps will be made to ensure broad based participation in interventions, straddling a range of Government and private stakeholders.

105. The ASCLME is consistent with OP #8 of the GEF, the Water-Body based Operational Programme. Further it is consistent with Strategic Priority IW-2 of the GEF for the International Waters focus area. This focuses on the expansion of GEF foundational capacity building work in priority African waterbodies. Moreover, the project stresses south-south learning opportunities, and technology transfer, particularly within the ASCLMEs region, where great asymmetries in institutional capacities are evident. The project will use institutions with high capacity to build capacity where it is weak<sup>41</sup>. In addition to the provision of GEF finance, the Programme will catalyze investments in LME management from other financing bodies. As the project targets two mainland LDCs and four SIDS<sup>42</sup>, it helps achieve the goal of ensuring project coverage in 90% of LDCs and 90% of SIDS. Finally, the ASCLMEs Programme further satisfies the IW Strategic Priorities by enabling countries to achieve targets agreed at the World Summit on Sustainable Development (Johannesburg WSSD, 2002). These include strengthened regional cooperation frameworks for sustainable management of the oceans, adoption of an ecosystem approach to fisheries management, and the maintenance or restoration of fish stocks on an urgent basis, and where possible by 2015.

### *Country Drivenness*

106. Each of the participating countries, through the endorsement of their GEF Focal Points, have reviewed and approved their participation in this Project. National support is further demonstrated by the following facts: (i) Participating countries are party to the Nairobi Convention, aimed at ensuring the judicious use of the ASCLMEs resources; (ii) Membership of the participating countries in such regionally based organizations as the Indian Ocean Tuna Commission, Indian Ocean Commission, and Southwest Indian Ocean Fisheries Commission; (iii) Membership in NEPAD and, through the

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<sup>41</sup> This approach, undertaken within the construct of the NEPAD Africa Process seeks to engender South-South links in the region, allowing the region to work collectively to address common problems.

<sup>42</sup> Two of the SIDS (Madagascar and Comoros) are also classed as LDCs. The mainland LDCs are Mozambique and Tanzania. Mauritius and Seychelles make up the remaining SIDS.

NEPAD process, agreement to foster sustainable development in marine and estuarine areas, taking an ecosystem based approach to management; and (iv) Endorsement of and active participation in activities undertaken during the preparatory stage of the project, including, among other things: participation in three expert workshops to frame overall project design, participation in decision making through meetings of the Project Steering Committee, and participation in activities aimed at strengthening Programme inter-linkages.

## **LINKAGES WITH UNDP COUNTRY PROGRAMMES**

107. Most of the ASCLMEs countries have identified poverty reduction as a priority issue for cooperation with the UNDP. UNDP is working to ensure that all environmental and sustainable development initiatives contribute to this agenda. The project will play a major role in sustaining the natural resource base, on which poor coastal communities in the ASCLMEs region depend for their sustenance. DLIST will make available scientific and other information generated through the ASCLMEs Programme to numerous stakeholder groups, engaged in the fight against poverty. This assistance, will, *inter alia* assist countries to adapt their poverty alleviation strategies, to incorporate measures that specifically address their specific vulnerability to environmental variability, fisheries depletion, etc. UNDP will ensure that the findings of the project inform efforts to update Poverty Reduction Strategies. The project is also clearly in line with UNDP regional priorities. Specifically, the project emphasis upon strengthening regional Programmes links closely with the Regional Cooperation Framework for Africa where Strategic Area of Support 1: Strengthening democratic and participatory governance result (e) aims specifically at ensuring: “sustainable development frameworks (are) in place in most countries and cross boundary water resources and energy resources (are) managed more effectively”. The project will make a major input towards UNDP efforts to strengthen NEPAD initiatives, through strengthening facilities for regional cooperation.

108. In addition, the project’s emphasis upon the sustainable management of the overall resource associated with these two marine ecosystems, including elements related to agriculture, land degradation and climate change, clearly links into global, regional, and country priorities of the UNDP in Africa, particularly as these relate to the UNDP focus on the achievement of the MDGs. There are close links to the work being supported by UNDP through the Nairobi based Dryland Development Centre, which assists countries to gauge vulnerability to drought and enhance drought preparedness. This is assisting countries to identify communities most at risk from drought, and take steps to reduce their vulnerability. This assistance has been identified as a priority in the National Action Plans (NAPs) to combat Desertification that the Centre has assisted several ASCLME countries to prepare. The project will contribute to these efforts by helping to improve drought prediction capabilities. The ASCLMEs region is prone to extreme weather events, which include severe tropical storms and flooding. Crisis prevention and recovery constitutes one of UNDP’s core focus areas, and UNDP has established a Disaster Reduction Unit, which is supporting countries in the ASCLMEs to prepare disaster risk assessments and improve their coordination capacity, in responding to natural disasters. Information on environmental variability generated through the ASCLMEs Project will allow countries to refine their disaster risk profiles and strengthen their accompanying disaster response strategies and activities. UNDP will work to ensure the findings are accommodated in national response measures, and make available information through its well established knowledge management networks.

## **LINKAGES WITH GEF FINANCED PROJECTS**

109. In addition to the linkages established among the three projects within the Programme, the project will establish key linkages with other GEF financed projects within the region. Annex 10 summarizes related GEF projects in Sub Saharan Africa that are relevant to the ASCLMEs project. It is expected that NEPAD will provide a focal point for linking the various African LME projects directly to one another. IW:LEARN will also serve to provide linkages between the relevant GEF projects at both the regional and global level.

## SUSTAINABILITY

110. The project is part of a long-term Programme, with discrete phases: 1] TDAs / SAPs formulation, 2] SAPs implementation. Phase 1 is designed to generate information and create foundational capacities, monitoring systems and knowledge management systems needed to set the ground for SAPs implementation. As information needed to prepare the TDAs / SAPs and effect management is sparse in the ASCLMEs, the project marks a departure from traditional TDA/ SAP projects, by making a major up-front provision for environmental assessment. This is necessary in order to set technically robust priorities for the SAPs. It is not intended that the project, in and by itself will establish a sustainable ecosystem management framework for the ASCLMEs. Provisions to ensure the creation and measures to ensure the sustainability of such a framework will be engendered during the SAPs implementation phase. The SAPs will contain provisions for needed policy reforms and institutional strengthening that will ensure the sustainability of interventions and ensure that targets embodied within the WSSD Plan of Implementation concerning coastal and marine ecosystems are realized and sustained. The project will ensure that foundational capacity is in place and data gaps that hitherto have hampered development of ecosystem-based approaches to management of the LMEs will be addressed. This will improve fundamentals for ensuring the sustainability of interventions during the SAPs implementation phase. A number of measures are planned during this phase, to set the grounds for ensuring the long-term institutional, political and financial sustainability of interventions during SAPs implementation.

111. The phased approach allows interventions to be scheduled within the absorptive capacities of the participating countries. There is considerable asymmetry in institutional capacities to plan, execute and interpret LME assessments in the region. A key strategy of the project in engendering institutional sustainability in these circumstances is to create partnerships at regional levels between institutions. National institutions responsible for continuing the activities that will be started under the project will be identified, as will regional centers of expertise, which will provide the locus for training activities. The strategy aims at pairing high capacities with weaker capacities to effect capacity transfer between institutions in the region. This approach, undertaken within the construct of the NEPAD Africa Process seeks to engender South-South links in the region, allowing the region to work collectively to address common problems. The strategy is expected to greatly enhance prospects for assuring institutional sustainability, building on existing regional competencies. The Capacity Building and Training Programme, to be developed collaboratively by ASCLMEs, ACEP and the SWIOFP will identify training needs for national institutions, which will provide the basis for the development of a training curriculum. This will be updated periodically, based on the outcomes of post-course questionnaires and independent evaluation. Formal training will be supplemented through indirect training, such as participation in cruises, and information exchange between institutions, facilitated through a dedicated kiosk, established under the auspices of DLIST.

112. A number of on-going political processes within the region provide the foundations for ensuring the political sustainability of interventions, and level of confidence that an ecosystem management framework for the ASCLMEs will be operationalized as part of SAPs implementation. These processes include those related to NEPAD, the Nairobi Convention, SADC, and the SWIOFC. The NEPAD has membership on the Project Steering Committee, as does the SADC. The Programme has established early linkages with the SWIOFC, and while the ASCLME and SWIOFP projects will be able to assist the SWIOFC over the period of project implementation by fulfilling many of the objectives that are foreseen by the SWIOFC, the SWIOFC will continue to exist beyond the life of the Programme and thus will be an instrument of sustainability over the longer term. The Nairobi Convention will also be a key vehicle for assuring the longer-term sustainability of the outcomes, outputs and activities of each of the projects under the overall Programme. Owing to the fact that many country representatives sit on the various Steering Committees of the three ASCLMEs projects, there is an immediate and effective linkage built in between the ASCLMEs Programme and Convention related processes. Finally, the Programme will help leverage resources from national budgets, and multi-lateral and bilateral funders to implement the activities identified as priorities in

the SAP. Interventions will help match funding needs with prospective funding sources. Economic evaluations of the costs and benefits of LME management will provide a basis for justifying budgetary appropriations to the Programme including from fishery license fees. This will be further facilitated through efforts to mainstream Programme activities within Poverty Reduction Strategies and Disaster Mitigation Programmes, which influence budget allocations, as well as donor funding.

## **REPLICABILITY**

113. The Programmatic Approach, through its use of the three IAs to undertake specific projects within the Programme based on comparative advantage, and the use of the three IAs to cooperatively define and finalize the TDAs and the SAPs are promising approaches for replication in other, future GEF IW projects. The iterative approach being taken for TDA and SAP development, using environmental baseline assessments to capture missing information to better inform the TDA and SAP development, is also an experiment that could well lead to more comprehensive and science driven TDAs and SAPs in future. Further, the emphasis on establishing strong scientific baselines across a broad range of oceanographic and biodiversity values in the ASCLMEs is also an approach that could be replicated in other developing regions where an ecosystem based approach is being applied to the management of LMEs. It is foreseen that the ASCLMEs project will result in establishment of a comprehensive scientific information base that will have utility, not only for the purposes of TDA and SAP development but will also serve as a platform for informing long-term management decisions for shared waters, fisheries and biodiversity. It is an approach that could well be of use for other GEF IW initiatives. The Programmatic approach to public participation and community education, through the incorporation of DLIST and other stakeholder involvement activities across a range of GEF projects in the ASCLMEs region, is also an approach that could lend itself to useful replication in other development regions where the GEF has cross-Programmatic interventions planned or underway. Last, the Project will also take advantage of IW:LEARN to develop training courses at the regional level and will be used to help both disseminate and harvest lessons/ good practices to and from other Projects. The project will develop a web site consistent with IW LEARN guidance will participate in IW LEARN events and e forums and makes funding provision to allow countries to participate in the biennial IW conferences.

## **STAKEHOLDER PARTICIPATION**

114. The ASCLMEs project includes a discrete outcome and attached outputs and activities aimed specifically at engendering broad based stakeholder participation in planned activities. A major vehicle for engendering public participation and community and institutionally based environmental education activities will be secured through the use of the Distance Learning and Information Tool (DLIST). The DLIST will allow scientific information to be demystified, and made relevant to the needs of different stakeholder groups. This will have bearing, beyond the management of fisheries and other marine resources for national development strategies and Programmes, disaster preparedness schemes, and adaptation initiatives, responding to climate change. DLIST is designed to be demand driven, and will provide a two-way information exchange system between scientists, managers and communities. This will allow the SAP to be progressively informed by and to respond to local needs, and take these into account when prioritizing interventions for future implementation. Other interventions include: development of networking opportunities between environmental education practitioners, development of resource materials on marine related topics, sensitive to the social and cultural milieu, the provision of targeted training opportunities for environmental educators, and the design and execution of a broad based media outreach initiative in the region. The costs of these activities will be shared between the GEF and ACEP, with funding from South Africa. Table 10 lists the key activities, products, and targets<sup>43</sup>.

### **TABLE 10: PARTICIPATION PLAN – PRODUCTS AND TARGETS**

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<sup>43</sup> Of the US\$ 3,100,000 the GEF increment will be US\$ 1,500,000 while ACEP will co-finance US\$ 900,000 and EcoAfrica US\$ 500,000.

<b>Output</b>	<b>Activity</b>	<b>Product</b>	<b>Target</b>
PP Project	Facilitation and coordination of PP activities in the region	Coordination of activities in each country	6 months from project start
	Meetings and workshops	Documentation and plans for PP in the region	6 months from start of project and annually
	Stakeholder consultations	Workshop/meeting proceedings and documents	7 months from start of project and annually
	Documentation of existing courses and EE Programmes/projects	Report and database	End 2006
Networking	Stakeholder analysis	Stakeholders list	
	Creation of ICT tool & Knowledge Management	DLIST	18 months from start of project
	Stakeholder communication	Website contributions; newsletter (print); media releases (print, TV); public presentations	Ongoing Bi-annually Ongoing  Ongoing
	Capacity building	Support structures for education and public awareness practitioners Annual meeting of coordinators	1 year from start will there be support structures and ongoing contributions First one 6 months from start of project then annually
	Representation at different networks and forums	Conference presentations and contributions to meetings	Ongoing, at least 2 annual international/regional conferences/meetings
Product development	Creation and documentation of short films and television Programme inserts	Films <ul style="list-style-type: none"> <li>• Educational</li> <li>• public interest</li> </ul>	2 annually from 2007 - 2009 4 annually from 2006 - 2008
	Development, documentation and showing of environmental theatre	Environmental theatre piece	12 month from start of project and updated annually till 2008
	Creation and documentation of distance course	Courses on coastal zone management	9 months after the start of the DLIST website
	Creation and documentation of EE school based materials	Books, CD-ROMs for schools based education	Annually 2 products developed in each country from 2007 till 2009
	Creation of display material and development of a culture of expositions	Models	6 models per country 2 years from project
	Creation and distribution of interpretive signage and posters	Posters	9 per country start 8 months from project start, 4 per country annually from 2007 till 2009
	Creation and documentation of field guides	Field/sampling guides	2 from 2007 till 2009
Training	Presentation of Coastal Zone course	DLIST course trainees/graduates	From 2007 -
	Educator training	trainees	10 000 till 2009
	Supervising and mentoring graduates	MED graduates PhD graduates Environmental Education certificate holders	8 at the end of 2009 4 at the end of 2009 20 at the end of 2009
	Experiential educator training	Educators exposed to first hand ocean research	45 by the end of 2009
Public	Experiential learning	Learners exposed to research vessels	4000 by the end of 2009

Output	Activity	Product	Target
Participation and Awareness		through on-board visits	
	Communication	Articles, newsletters, public workshops, community presentations	Widespread through out the life of the project
	Information sharing	DLIST outreach component  DLIST Maintenance  Informed stakeholders Community aware of marine environment School outreach Museum/expo displays	After completion of course development and initial tool development 2007-2010 Ongoing Ongoing  2 annual events 2 annual events
TOTAL			

### PART III: MANAGEMENT ARRANGEMENTS

#### IMPLEMENTING AGENCY CONSULTATIONS, LINKAGES, AND COOPERATION

115. The Implementing Agencies (UNDP, UNEP and the WB) have been and will continue to work collaboratively toward the realization of the overall objectives of the ASCLMEs Programme. Each of the three IAs has been represented at most of the preparation sessions for the respective projects of the Programme. The WB implemented SWIOFP project and the UNDP implemented ASCLMEs project were developed in close collaboration between the respective Project Managers and other expert resources associated with the two projects. These two projects have collaborated closely in developing their respective baselines and logical frameworks. The latter accommodates outputs of the WIO-LaB project.

116. The **Programme Coordination Committee (PCC)** would be comprised of members from each of the projects. Overall responsibility for coordination will be assumed by the UNDP implemented ASCLMEs project. Each of the projects within the Programmatic approach would be represented on the PCC by the respective task team leaders for the IAs, Project Managers, and two members from each of the respective Project Steering Committees. The PCC would meet not less than once annually, and will meet at the call of any of the project managers. Among other things, the PCC would focus on a unified approach to capacity building, LME module coverage, TDAs and SAPs development, donor recruitment and other issues to ensure long-term Programme sustainability. The UNDP, working through the PCC would also ensure that projects in combination and in relation to other related projects and Programmes within the region.

117. The UNDP ASCLMEs project will also assume ultimate responsibility for the development of the TDAs and SAPs that will be a principal product of the Programmatic approach. It is foreseen that two TDAs and two SAPs will be required within the Programmatic approach for the two LMEs, one for the Agulhas LME and a separate TDA and SAP for the Somali LME<sup>44</sup>. The UNDP ASCLMEs project will utilize TDA and SAP inputs from the WIO-LaB and SWIOFP projects in final TDAs and SAPs preparation, utilizing also Interministerial Committees (IMCs) and technical workgroups as necessary to assure a comprehensive TDA and SAP for the Agulhas LME and an interim TDA for the Somali LME. A harmonized implementation structure for the projects has been agreed to by the IAs:

- ◆ Each of the Project Managers will sit on the respective Project Steering Committees established

<sup>44</sup> As previously mentioned, it will not be possible to do a comprehensive TDA and SAP for the Somali LME due to the continuing instability in Somalia, which comprises a large shoreline area for the Somali LME. Emphasis at the early stages would be on the East African Coastal Current area.

under the Programme, to assure a continuing and effective set of Programmatic linkages, the avoidance of activity duplication, and the creation of cost efficiencies at the administrative level.

- ◆ The Regional Management Office of SWIOFP will house the Cruise Coordinator (A ship coordination specialist). This expert will be an ASCLMEs Programme officer and the funding to support the position, including provision of office space and support, will be assumed by SWIOFP.
- ◆ The Regional Management Office of the UNDP ASCLMEs project will house the ASCLMEs Information Systems Officer. This expert will be an ASCLMEs Programme officer and funding to support the position, including provision of office space and support, will be assumed by the UNDP ASCLMEs project.
- ◆ Annual Work Programmes for the three projects will be prepared jointly, using the vehicle of an annual Programme meeting. The responsibility for hosting this meeting will alternate among the projects, and the UNDP ASCLMEs project will be responsible for overall coordination. Further, the annual Programme meetings will include comprehensive reports from each of the projects on the status of information gathering pursuant to TDAs and SAPs preparation.
- ◆ EcoAfrica, working closely with NEPAD, will execute the DLIST pilot activity on behalf of the UNDP ASCLMEs project and for the benefit of the three projects within the ASCLMEs Programme as a whole. EcoAfrica has successfully assumed such a role for the GEF supported Benguela Current Large Marine Ecosystem project.

## EXECUTING ARRANGEMENTS

118. **Project execution** for the UNDP ASCLMEs project will be the responsibility of the United Nations Office of Project Services (UNOPS), through its Global and Inter-Regional Division in accordance with standard operational, financial guidelines and procedures. UNOPS will remain accountable to UNDP for the delivery of agreed outputs as per agreed project work plans, and for financial management, and ensuring cost-effectiveness.

119. The Project will be driven at policy and strategic level by a **Project Steering Committee**. The Project Steering Committee will have 14 Permanent Members, as follows:

- One representative from each participating country: Comores, Kenya, Madagascar Mauritius, Mozambique, Seychelles, South Africa, Tanzania
- One Representative from ACEP
- One representative from UNDP;
- One representative from NEPAD;
- One representative from UNDP-GEF;
- One representative from UNOPS; and
- One representative from the Nairobi Convention

120. The PSC will also include members with observer status, such as:

- Donor agencies providing co-financing (France, Norway);
- Technical agencies (NOAA);
- Project Managers for WIOLAB/SWIOFP; and
- Relevant representatives of the Private Sector and NGOs may be invited to attend PSC meetings whenever required.

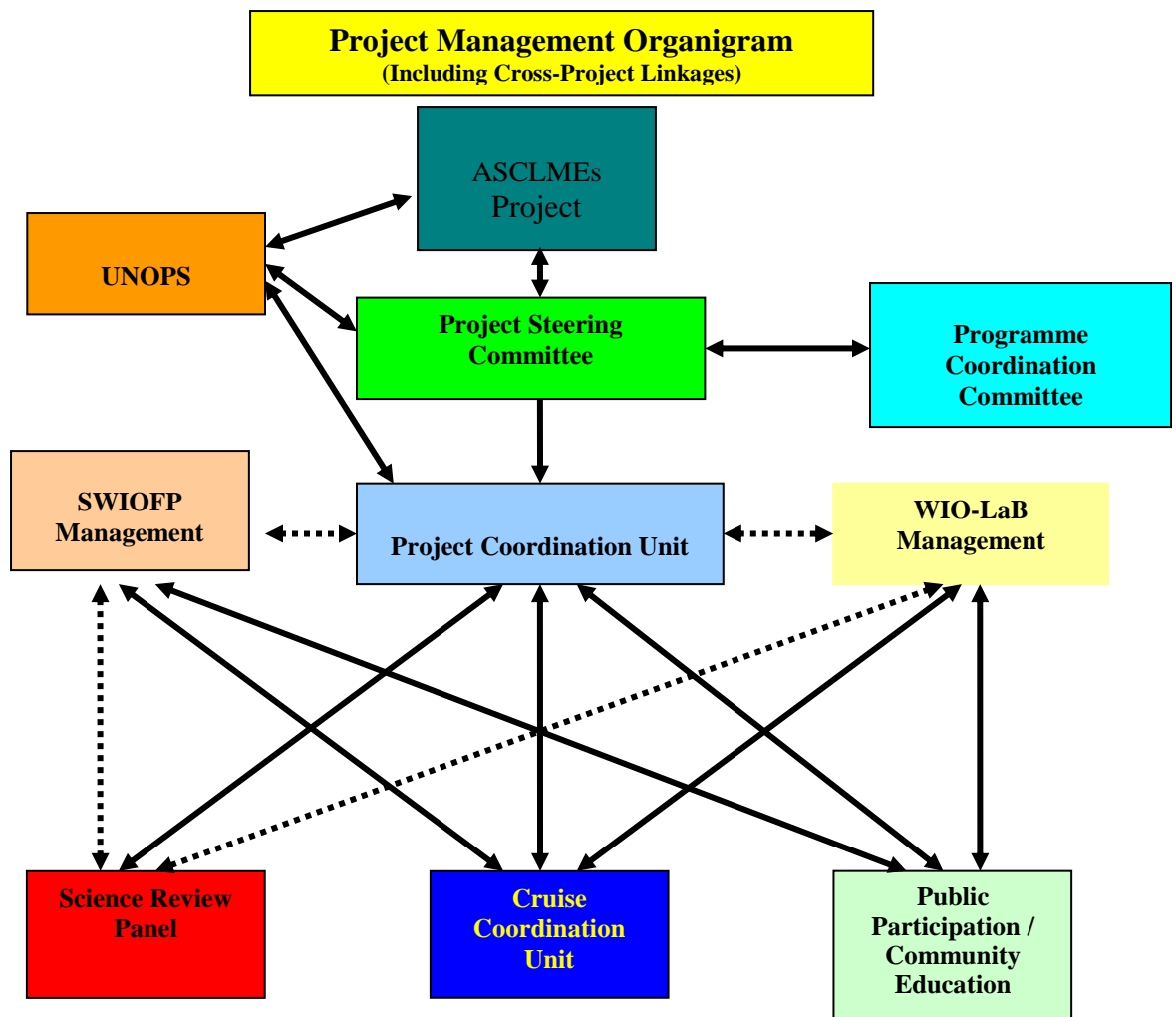
121. The PSC will meet annually to monitor progress in project implementation, provide strategic and policy guidance, and review and approve work plans and budgets. PSC meetings will be chaired by the national representative in the country hosting the meeting. The PSC will retain the authority to amend its membership as it deems necessary.

122. There will be a small Project Coordination Unit (PCU) located in South Africa. The PCU will consist of an internationally recruited Project Manager, a Programme Science Advisor, a Communications Director, a Financial and Accounting Officer, and an Administrative Assistant, and

other administrative and secretarial personnel retained on a full-time or contractual basis, as needed. International and National consultants will also be retained as needed, with the provision that nationally based expertise will be sought in the first instance. The PCU will also be a meeting site for, and serve a secretariat function on behalf of a Project Science Review Panel. The Science Review Panel will be comprised of three core members chosen from the PSC. Finally, the Project will assist in supporting a Cruise Coordinating Group (CCG). The CCG will, in cooperation with SWIOFP and WIO-LaB, be charged with the scheduling and careful coordination of each of the cruises associated with project work, including make-up of country expertise and trainees, specific functions, locations, etc. The projects will hire a professional Cruise Coordinator to manage the very complex logistics of the various ships and numerous cruises that the projects will be undertaking jointly and singly. They will possess the scientific credentials necessary to evaluate the scientific soundness of project activities and will report to the full PSC. The Project Science Review Panel may, at its discretion and consistent with available resources, strike specific sub-committees of experts to peer review ongoing or completed activities. The Project Manager through the PCU will ensure the requisite level of communication and coordination with the other Projects that are part of the ASCLMEs Programme, and other GEF supported LME projects, non-GEF related projects and Programmes, donors, and other groups and individuals as may be necessary to ensure successful implementation. Figure 2 shows the planned project management arrangements.



**FIGURE C: ORGANIGRAM OF PROJECT MANAGEMENT STRUCTURE**



**PART IV: MONITORING AND EVALUATION PLAN AND BUDGET**

123. The Monitoring and Evaluation Plan provides for a series of linked activities, including annual Project Implementation Reviews (PIR), Tripartite Reviews, Quarterly Project Reports, Work Plans, and independent mid-term and final project Evaluations (see Table 11). A number of process indicators (PIs) to guide monitoring and evaluation activities are provided in the Log frame. PIs may be further partitioned into two types: the first relates to processes necessary to achieve the outcomes of the project, while the second type aims at measuring progress in ensuring the long term sustainability of management. In the first category PIs include, *inter alia*, such indicators as the establishment and successful functioning of the Project Steering Committee, establishment of the DLIST Programme, the ability of project management, through the countries, to successfully incorporate country expertise into cruises, GIS work, and other exercises related to the filling of identified science gaps. Examples of the second category of PIs would include, among others, the establishment of mechanisms that would enable the countries to consolidate and manage over the long-term a data management centre. While the first category of PIs have already been selected, the second would be determined upon project inception and might include the establishment of more effective regulations for regional and country-based fisheries based on improved scientific

understanding of the large marine ecosystems, enactment and implementation of improved policy and legislation for fisheries and coastal zone management to protect vulnerable coastal habitat and enhance the sustainability of fisheries,

124. Environmental status and stress reduction indicators (SRIs), consistent with GEF IWM&E strategies will be identified at a Programme level, by the three projects as part of the process of preparing the SAP<sup>45</sup>. The latter could include, *inter alia*, protection of critical spawning habitat with consequent, measurable benefits for artisanal and commercial fishers, measures for the protection of watershed catchment areas, and quantification of benefits deriving from increased, environmentally friendly behavioral practices in coastal zone areas. These indicators will provide a basis for monitoring performance towards agreed outcomes and the impacts of activities during SAP implementation.

## **PROGRESS AND ON-GOING EVALUATION REPORTS**

125. Project objectives, outputs and emerging issues will be regularly reviewed and evaluated annually by the PSC. Reporting (annual and quarterly) will be done in accordance with UNDP, UNOPS and GEF rules and regulations. The Annual Programme/Project Report/Project Implementation Review (APR/PIR) is designed to obtain the independent views of the main stakeholders of a project on its relevance, performance and the likelihood of its success. The APR/PIR form has two parts. Part I asks for a rating of project relevance and performance as well as an overall rating of the project. Part II asks for a textual assessment of the project, focusing on major achievements, early evidence of success, issues and problems, recommendations and lessons learned. The APR/PIR will be prepared by the Project Manager, after consultation with the Steering Committee and relevant Stakeholders, and will be submitted to UNDP for review and approval. Quarterly progress reports will be prepared using the same procedures. The project will be subject to the various evaluation and review mechanisms of UNDP, including the Tri-Partite Review (TPR) and periodic supervision and evaluation missions. The project will also participate in the annual Project Implementation Review (PIR) of the GEF. The PIR is mandatory for all GEF projects that have been under implementation for at least a year at the time that the exercise is conducted. Particular emphasis will be given to emerging GEF policy guidance in the context of the IW focus area.

## **MID-TERM AND TERMINAL EVALUATIONS**

126. Independent monitoring of the project will be undertaken through contract, using a balanced group of experts selected by UNDP, in collaboration with UNOPS. The extensive experience of UNDP in monitoring large regional projects will be drawn upon to ensure that the project activities are carefully documented. There will be two evaluation periods, one at mid-term and another at the end of the Project. The mid-point review will focus on relevance, performance (effectiveness, efficiency and timeliness), and issues requiring decisions and actions and initial lessons learned about project design, implementation and management. The final evaluation will focus on similar issues as the mid-term evaluation but will also look at early signs of potential impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental goals. Recommendations on follow-up activities for Phase 2 implementation will also be provided. Last, monitoring and evaluation at the scientific level will be undertaken on an as needed basis through the Project Science Advisory Board.

## **EXTERNAL REPORTING**

127. The monitoring and evaluation process for the project are summarized in Table 11 below:

**TABLE 11: MONITORING AND EVALUATION TEMPLATE**

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<sup>45</sup> The strategy for establishing such indicators will be codified in the M&E Plan available at CEO endorsement.

Activity	Responsibilities	Timeframes
Drafting Project Planning Documents: ProDoc, LogFrame (including indicators), M&E Plan	UNDP staff and consultants and other pertinent stakeholders. Steering Committee Review	During project design stage
M&E Plan	UNDP, PSC, project development specialists	During project design stage
Work Plan	Project Manager, with UNDP	Annually (first year: inception report)
Quarterly Operational Reports (QORs)	UNDP and PPR	Quarterly
Annual Programme/ Project Reports (APRs) Project Implementation Review (PIR)	The Steering Committee, working closely with UNDP and the Project Manager in consultation with Project stakeholders UNDP, project team, S.C., GEF M&E team	Annually Annually, between June and September
Tripartite Review (TPR)	Governments, UNDP, project team, Steering Committee, beneficiaries and other stakeholders	Annually
Mid-term and Final evaluations	UNDP, project team, S.C., independent evaluators	At the mid-point and end of project implementation.
Terminal Report	UNDP, Project Manager, S.C.	At least one month before the end of the project
Post-Project Sustainability Evaluations	UNDP, Project Team and GEF, S.C.	Toward end of 3 <sup>rd</sup> . year after Project Inception

128. UNDP, as the Implementing Agency, shall also be responsible for monitoring Project performance to ensure conformity with Project objectives and advising UNOPS on implementation issues.

## BUDGET

129. The total cost of the project is estimated to be US\$ 31,531,500, with GEF funding in the amount US\$ 12,200,000 (excluding preparatory assistance). Co-financing has been secured from the Participating Countries, South Africa/ACEP, the Government of Norway, France, UNEP, FAO, and EcoAfrica. The Full project would be implemented over a period of 4 years. A number of activities (e.g. cruises and preparation of the TDAs and SAPs) will be undertaken on a cost-shared basis with SWIOFP and WIO-LaB.

**TABLE 12: OUTPUT BUDGET FOR PROJECT**

Project Outcomes/Activities/Outputs	Amount (US\$)		Total US\$
	GEF	Total Co-finance	
<b>Outcome 1:</b>			
1.1. Prioritised information gaps in ecosystemic processes in key geographic areas of ASCLMEs are addressed	5,000,000	9,000,000(SA/ACEP); 2,100,000 (Norway); 415,000 (Governments); 350,000 (UNEP); 150,000 (FAO)	16,850,000
1.2. Baseline information obtained on persistent organic pollutants (POPs) within the LMEs through use of key indicator species	250,000	500,000 (France); 100,000 (UNEP); 30,000 (Governments)	900,000
1.3 Key knowledge gaps in near-shore (artisanal) fisheries updated, nursery areas and other biologically rich habitat mapped or otherwise identified	500,000	285,000 (Governments)	785,000
1.4 A region wide economic valuation of near-shore and marine goods and services is undertaken	400,000	235,000 (Governments)	635,000
<b>Total Outcome 1</b>	<b>6,150,000</b>	<b>13,165,000</b>	<b>19,315,000</b>
<b>Outcome 2:</b>			
2.1 Facilitate establishment of a data	200,000	230,000 (Governments);	530,000

Project Outcomes/Activities/Outputs	Amount (US\$)		Total US\$
	GEF	Total Co-finance	
management facility or facilities for the continuing collection, synthesis and storage of country and regional data, and the repatriation of extra-regional data and information.		100,000 (UNEP)	
2.2 Establish a coordinated plan for assembling and reporting on agreed indicators for monitoring and evaluation of the status of the Agulhas and Somali LMEs	200,000	112,500 (Governments); 100,000 (UNEP)	412,500,00
2.3 Increased systems knowledge through the use of GIS and predictive models	825,000	1,000,000 (ACEP); 275,000 (Governments); 100,000 (UNEP)	2,200,000
<b>Total Outcome 2</b>	<b>1,225,000</b>	<b>1, 917,500</b>	<b>3,142,500</b>
<b>Outcome 3:</b>			
3.1. Financial resources brokered to ensure the financial sustainability of information systems	150,000	150,000 (ACEP); 10,000 (Governments)	310,000
3.2 Institutional, Programme and human capacity building requirements are identified and addressed through training initiatives.	900,000	200,000 (Governments); 1,000,000 (ACEP); 100,000 (FAO)	2,200,000
3.3 Close and regularized communication established among the IAs, the various Projects under the Programme, and related GEF supported biodiversity projects, and other related projects and institutions in the region	300,000	4,500 (Governments); 155,000 (ACEP)	459,500
3.4 Linkages with other GEF supported LME projects in Sub-Saharan Africa and globally are established and maintained, and project personnel are enabled to attend relevant workshops and conferences regionally and globally.	375,000	4,500 (Governments)	379,500
3.5 TDAs and SAPs finalized.	1,600,000	797,500 (Governments)	2,397,500
<b>Total outcome 3</b>	<b>3,325,000</b>	<b>2,421,500</b>	<b>5,746,500</b>
<b>Outcome 4:</b>			
4.1 A distance learning and information-sharing tool (DLIST) is developed and implemented for the Programme.	1,050,000	450,000 (EcoAfrica); 215,000 (Governments)	1,715,000
4.2 New and enhanced existing public involvement, participation, and environmental education initiatives are developed and implemented in the region.	450,000	900,000 (ACEP); 212,500 (Governments); 50,000 (EcoAfrica)	1,612,500
<b>Total Outcome 4</b>	<b>1,500,000</b>	<b>1, 827,500</b>	<b>3,327,500</b>
<b>Total full project</b>	<b>12,200,000</b>	<b>19,331,500</b>	<b>31,531,500</b>
Project Preparation	723,000	457,500	1,180,500
<b>GRAND TOTAL (FULL PROJECT + PREPARATION)</b>	<b>12,923,000</b>	<b>19,789.000</b>	<b>32,712,000</b>

## SECTION II: STRATEGIC RESULTS FRAMEWORK AND GEF INCREMENT

### PART I: INCREMENTAL COST ANALYSIS

130. The ASCLMEs are strategically important as sources of local livelihoods, and for the provision of ecological services. A number of national and international initiatives are underway to facilitate the sustainable use of coastal and marine resources. These activities form a set of baseline activities that can be characterized as generally beneficial, in terms of their contribution towards fulfilling management needs, but insufficient to achieve an ecosystem based approach to management. The incremental cost analysis below provides greater detail on baseline activities currently underway and sets out the incremental costs attached to planned project interventions.

#### Baseline

131. A joint baseline scenario was developed by the ASCLMEs and SWIOFP projects. The baseline represents an assessment of the current and planned national and international investment in the ASCLMEs region in activities complementary to the components of the two projects, namely: marine and coastal research, monitoring, and management. This includes support to relevant activities within Government ministries and departments, externally funded donor projects, and regional initiatives. Only expenditures related to the activities identified in the GEF alternative to be incurred over the lifetime of the projects were included in the baseline assessment. A breakdown of baseline activities and costs is presented in the Incremental Cost matrix and attached tables. Of the total calculated baseline of US\$ 194.5 million, approximately US\$111.5 million serves as the baseline for SWIOFP and US\$ 83 million for ASCLMEs.

132. The principal threats facing the region have been described above and in Annex 4. Under the baseline scenario a number of interventions, primarily nationally based are being financed to improve country specific coastal zone resource management. Further, international organizations such as the IOTC and the IOC, and multi-lateral and bi-lateral donors such as the EU and France are financing measures largely aimed at managing the region's offshore tuna fishery, and the IOC is a major contributor in Tsunami related work in the Indian Ocean. While insufficient to address the number and severity of threats described in the Threats table (Table 4) these initiatives give the region at least a rudimentary basis that can be built upon by the combined activities of the ASCLMEs Programme. Successful mitigation of the identified threats will be determined, in part by the extent to which outstanding knowledge gaps are filled in the areas of oceanography, fisheries, pollution from land-based sources, and open ocean pollution (oil). These knowledge gaps need to be filled to formulate TDAs and SAPs for the Agulhas LME and Somali LME, to direct management effort and funding to dealing with the most potent pressures.

133. Priority environmental knowledge gaps are filled. The total baseline investment under this Outcome is estimated at US\$ 60,000,000. This amount includes the budgets of dedicated, government run and university sponsored oceanographic institutes and departments in the participating countries and portions of other ministerial budgets, primarily fisheries, related to this Outcome. Virtually all the country specific baseline is dedicated to national level effort (approximately US\$ 23 million). The overall donor baseline is estimated to be US\$ 37 million. A substantial part of this donor baseline is committed to the coastal zone areas of the participating countries, and a much smaller percentage of the total derives from multi-lateral (EU) and bi-lateral (France) assistance that does address regional level oceanographic research (largely in relation to the tuna fishery). While limited in human and financial terms, some of the baseline activities at national level, within government ministries and departments and universities will be helpful to the project and overall Programme by making available personnel and graduate students whose paid and/or academic time can be invested in regional activities.

134. A long-term Programme is established for data and information collection, synthesis, storage, and dissemination and system monitoring. Baseline funding for this Outcome is estimated to be US\$ 5,000,000. Ecosystem level monitoring (coastal, riparian, shallow and deep water) even within national boundaries is not common and many countries face difficulty monitoring commercial marine resources. Many fisheries departments engage in limited MCS activity within the EEZ, but even this modest level of activity is limited by resource constraints. Donor financed MCS projects to increase the capacity of national governments to monitor their national waters (Madagascar, Tanzania, and Seychelles) are underway. The majority funding for this baseline at national level derives from country specific funding in government departments for national data and information collection and storage, and universities and regional institutions such as IOTC and IOC which contain national as well as regional data information. No baseline funding is currently committed to data and information collection, storage, and synthesis across the entire region, nor is there any baseline funding for stakeholder access to regionally based information. Additionally, each country has to varying degrees established GIS capability and funding committed to GIS effort (approximately US\$ 2,000,000 over four years) will serve as a basis for projects and Programme related activities to regionalize GIS efforts.

135. Measures to ensure the financial and institutional sustainability and application of information management systems. The baseline amount for this Outcome is estimated to US\$ 10,000,000. Approximately half of this amount is in-kind government contributions to meet responsibilities of membership in the various regional institutions, including travel costs, salaries, communications, and subsistence expenses. These regional organizations include NEPAD, the Indian Ocean Tuna Commission, the Indian Ocean Commission, the new Southwest Indian Ocean Fisheries Commission, the Nairobi Convention, and SADC. The remainder of the baseline derives from country assumed training and attendance at extra-regional conferences and workshops and the application of country specific data to inform national level management decisions concerning coastal zone management and near and off shore fisheries.

136. A comprehensive Programme of public participation to enable stakeholders to participate in Programme activities. The baseline for this project Outcome is estimated to be US\$ 3 million. This total includes country specific investments in public participation in coastal areas and for national objectives. No baseline finance is committed by the countries or by the existing array of international donors for regionally based public participation or environmental education initiatives dealing with LMEs as a unit.

137. A table summarizing the regional baseline and gaps follows:

**TABLE 13: REGIONAL BASELINE AND GAPS**

Baseline Activity	Organization/Project/ Programme	Gaps
<u>Oceanographic Assessment</u> Country EEZ based oceanographic research, data and information creation, collection and storage	Government Oceanographic Institutes or oceanographic departments in environment or fisheries ministries	Little or no emphasis on transboundary issues. Very shallow layer of trained oceanographers and limited budgets limit the number of ship cruises and purchase of specialized equipment for non-ship based activities such as GIS based modelling. Limited opportunity for extra-national training. Data and information is nationally based and not generally shared at regional level. Public participation generally not emphasized.

Baseline Activity	Organization/Project/ Programme	Gaps
<u>Training</u> (Physical and Chemical Oceanography and related Ecology/ Biology disciplines)  Training of oceanographers Training marine scientists	University based oceanographic and marine sciences advanced degree Programmes	With the exception of South Africa, and a marine science program at the Univ. of Dar es Salaam, very low enrolments and limited or no oceanographic or marine sciences Programmes offered in curricula. Retention of university trained scientists very difficult. Limited ability for professional advancement (connected to low retention rates).
<u>Applied Research</u>  Marine ecology Bio-indicators Ecosystem modelling Fish inventories  Mascarene Plateau	French IRD (THETIS Programme), ECOMAR, IFREMER ODINAfrica  Shoals of Capricorn Project (RGS). Training in scientific, practical and marine safety skills, in order to support research	Entry level is large pelagic fisheries giving limited breadth to ecosystem based, LME approach. Limited geographic range of interest across the ASCLMEs due to limited membership of project participating countries. Country and regional capacity building emphasis limited in scope. Data and information not generally available at regional level and more narrowly targeted to tuna and other large pelagic fish.  Specific focus on Mauritius and Seychelles rather than region as a whole.
<u>Information Management</u>  Establishment and maintenance of marine sciences data and information bases. Electronic access to four main gateways of ocean related information	ODINAfrica  UN Atlas of the Oceans	Data and information fragmented across institutions. Data sets are not consistent across the region. There is no regional database.  Serves as a repository of selected marine based data and information. No operational capacity in the WIO.
<u>Integrated Coastal Zone Management (ICZM)</u>  Management of marine biodiversity and natural resources Awareness activities in the CZ Regional Training and Excellence Centers Negotiating capacity Pilot CZM projects	EU IOC/COMESA National activities in Kenya, Madagascar, Mauritius, Mozambique, Seychelles South Africa, Tanzania	No emphasis on offshore areas as needed to ensure LME level management. Data and information will be limited primarily to coastal areas and covering coastal marine resources, as will training and public participation initiatives including awareness building.
<u>Pollution Abatement</u>  Coastal zone and EEZ based pollution abatement	Ministries of Environment and related Departments and Agencies	Lack of accurate data baselines to measure relative levels of pollution makes much activity reactive in nature. A shallow layer of trained staff, poor training opportunities, and limited budgets make monitoring and enforcement activity difficult. There is very little interaction among ministry personnel at the regional level, and correspondingly, limited sharing of data sets.
<u>Fishery Management (Stock Assessment)</u> Tuna resource assessment and management including research on and monitoring of stocks, tagging, targeted to tuna and related, large pelagic species	IOTC	Focus is on tuna stocks and no significant emphasis on LME approach. Some of the participating countries are not IOTC members. No near-shore emphasis. Limited emphasis on country capacity building for LME based investigations. Data and information targeted to tuna and related species. Some data and information likely to be proprietary.
<u>Artisanal Fisheries</u> Improve understanding of small scale fisheries Address destructive fishing practices	Jakarta Mandate (NORAD and IUCN)	No overall emphasis on LME wide science and LME wide management approaches.

Baseline Activity	Organization/Project/ Programme	Gaps
<u>Fisheries Management: Control</u> Improved management of fisheries through institutional capacity building in monitoring, control and surveillance	SADC MCS Programme (EU)	Emphasis limited to fisheries resources. Not all participating countries are members of the SADC thus limited geographic scope. Little data and information collected.
<u>Environmental Variability</u> Exploration of causes and effects of coral bleaching and mass mortality of corals in seven countries of the WIO Scattered research on Ocean-atmosphere links and meteorology of the Indian Ocean	CORDIO-SIDA Project	Activities confined to coral reefs and no overall emphasis on LME based management.  Information not codified and available to the region
<u>Conservation of Biodiversity</u> Creation of a participating network of MPAs Creation of a working network of MPA managers	WIO-MPA (WWF/FFEM/CI)	Narrow focus on marine and coastal protected areas. Some capacity building but again targeted to MPA personnel. Capacity building and stakeholder involvement primarily tied to coastal zone related management and resource issues.
<u>Awareness Raising</u> Increase public awareness on related issues Plan and conduct targeted research activities of national and regional importance Disseminate information and data aimed at helping to achieve sustainable use	Marine Science for Management Programme (SIDA) and administered by WIOMSA  Shoals of Capricorn Project (RGS)	Restricted to coastal environment and no significant emphasis or focus on LME wide management issues or the filling of LME wide knowledge gaps.  Project reach limited to Seychelles and Mauritius and limited emphasis on coastal and coral reef based ecology.

## The GEF Alternative

138. The overall global environmental objective of the ASCLMEs Programme is to ensure the long-term sustainability of the living resources of the ASCLMEs through an ecosystem based management approach. The goal is being pursued through a set of related GEF interventions (the UNEP sponsored WIO-LaB, the World Bank sponsored SWIOFP, and the UNDP sponsored ASCLMEs Project) as well as nationally and internationally supported projects in marine research and ecosystem management that are closely aligned to SWIOFP and ASCLME objectives. The objectives of the SWIOFP and ASCLMEs project are to: (i) establish the status of existing exploited resources and improve understanding of transboundary marine resources of the ASCLMEs region; and (ii) improve capacity for ecosystem management at community, national and regional levels. The expected outputs of the two projects are establishment of baseline data and information on oceanographic parameters, fish and fisheries both in and off-shore, productivity, oceanography, geoscience, biodiversity, and persistent organic pollutants. The projects will further establish information systems to facilitate decision support, and build foundational capacities that can be applied in future to regional ecosystem management endeavors. Work undertaken through the two projects will result in significant inputs to the development of two Transboundary Diagnostic Analyses (TDAs) and two Strategic Action Programmes (SAPs) for the two LMEs respectively. The ASCLMEs contribution to this will be: identification of oceanographic and biological characteristics of the LMEs; establishment of baselines for key bio-physical characteristics; artisanal fisheries, estimates of anthropogenic and environmental factors affecting overall ecosystem health, particularly coastal zones and marine areas beyond EEZ boundaries; persistent organic pollutants, biodiversity, and environmental variability.

139. GEF funds will be used to finance the incremental costs associated with regional and sub-regional activities designed to promote sustainable management of shared resources in the Agulhas and Somali LMEs. More specifically the GEF will finance the incremental costs of: (i) assisting groups of countries to better understand the environmental concerns of their international waters and



work collaboratively to address them; (ii) building capacity of existing institutions, or through new institutional arrangements, to utilize a more comprehensive approach for addressing transboundary water-related environmental concerns; and (iii) putting in place SAPs to guide implementation of sustainable measures that address such environmental concerns.

### **Incremental Costs**

140. Outcome 1: Key ecosystem assessment and management gaps are filled as necessary to install an ecosystem approach to LME management (Baseline: US\$ 60 million; Incremental Cost: US\$ 19.315 million out of which GEF financing is US\$6.150 million). The ASCLMEs project will build on existing scientific knowledge by consolidating and evaluating existing data on oceanographic and biological characteristics of the LMEs and financing targeted research to fill information gaps and inform subsequent management decisions. The GEF alternative will finance efforts to consolidate information related to the ASCLMEs. GEF funds will also finance targeted assessments likely to include, among others, assessments of certain oceanic features and anomalies, factors affecting variability in LMEs, understanding of LME interfaces, productivity, larval transport, mapping of key fish nursery and spawning areas, energy flows and food webs, and provide spatial data on ecosystems, marine habitats (including sea mounts), ecosystem connectivity, improve understanding of the downstream impacts of land based and marine pollution (including of POPs and heavy metals), and produce a regionally-based economic valuation study focused on near-shore goods and services.

141. Outcome 2: Decision-making tools are in place, to facilitate the synthesis and application of data for LME management; (Baseline: US\$ 10 million; Incremental Cost: US\$ 3.142.500 million out of which GEF financing is US\$ 1.225 million). The GEF Alternative will support development of a set of GEF IW based process, stress reduction, and environmental status indicators for the ASCLMEs project and build on baseline monitoring efforts by supporting identification, establishment and operation of institutional and participatory mechanisms for assembling and reporting on indicators for monitoring and evaluation of ecosystem. GEF funds will finance the process of establishing agreed upon indicators including training, technical assistance, workshops, and pilot monitoring activities.

142. Outcome 3: Regional agreement is reached on transboundary priorities and their root causes and a suite of governance reforms and investments needed to institute a shared ecosystem-based approach to managing the LMEs in support of WSSD targets, and foundational capacities are in place for implementation. (Baseline: US\$ 10 million; Incremental Cost: US\$ 5.746.500 million out of which GEF financing is US\$ 3.325 million). The GEF alternative will support the transaction costs necessary to the development of regional mechanisms for management of the ASCLMEs. GEF funds will finance development and refinement of the TDA and SAP, regional coordination activities between ASCLME countries, and human and institutional capacity building related to building capacity for regionally based ecosystem assessments and information management.

143. Outcome 4: A Comprehensive Public Participation Initiative Enables Stakeholders to Engage in Programme activities. (Baseline: US\$ 3 million; Incremental Cost: US\$ 3.327 million out of which GEF financing is US\$1.5 million). The ASCLMEs project will engage in an active public participation and awareness-raising effort through development of distance learning and information sharing tools (DLIST). GEF funds will finance development of learning and information tools, documentation of project outputs, networking, and development of an internet based learning platform to reach different constituencies.

### **Co- Financing**

144. Co-financing for the GEF alternative will be provided by the South Africa/ACEP Programme, the Participating Countries, Norway (research vessel time), France, UNEP, FAO, and EcoAfrica.

**TABLE 14: PROJECT INCREMENTAL COST MATRIX**

ASCLMEs Project Component	Cost Category	US\$ Million	Domestic Benefit	Global Benefit
<b>ASCLMEs</b>				
Outcome 1: <i>Key ecosystem assessment and management gaps are filled as necessary to install an ecosystem approach to LME management</i>	Baseline	60.0	A number of ongoing initiatives in oceanographic research provide some base of knowledge for management of national resources.	Incomplete knowledge of overall Agulhas and Somali LME systems; current knowledge base gives partial picture of large scale processes and dynamics of the LME systems, key oceanographic characteristics unknown.
	GEF Alternative	79.315	Improved understanding of ecosystem status and threats within national boundaries; more comprehensive knowledge of ecosystem health to underpin national decision-making.	Identification of data gaps in oceanographic and associated environmental data sets across region, including specific data on anthropogenic threats, natural perturbations and their interactions within the LME systems.
	Incremental Cost	19.315	GEF: US\$ 6.150 million; SA/ACEP: US\$ 9 million; FAO .150 million; France: US\$ .5 million; UNEP: US\$ .450 million Gov. of Norway: US\$ 2.100 million Govt. Contribution: US\$ .0.3 million.	
Outcome 2: <i>Decision-making tools are in place, to facilitate the synthesis and application of data for LME management;</i>	Baseline	10.0	Functioning national monitoring system for specific resources such as key marine processes, artisanal and deep-water fisheries, and coastal zone related information at national scale.	National monitoring systems insufficient for adequate, integrated monitoring of entire Agulhas and Somali LME systems, particularly for off-shore and shared resources.
	GEF Alternative	13.142.5	National monitoring systems strengthened for overall ecosystem and inclusive of marine and coastal resources.	Establishment of regional monitoring system and repository for data and information, and creation of a funded institutional and procedural approach for LME level monitoring, evaluation and reporting. Regional data and information system helps create base for regional approach to LMEs management. Repatriation of data enhances regional knowledge base and enhances regional approach to management.
	Incremental Cost	3.142.5	GEF: US\$ 1.225 million; ACEP: 1 million; UNEP: US\$ .300 million; Govt. Contribution: US\$ .6175 million	
Outcome 3: <i>Regional agreement is reached on transboundary priorities and their root causes and a suite of</i>	Baseline	10.0	Ongoing national Programmes and participation in regional bodies provide national benefits in terms of more sustainable management of national resources. Opportunity created for	Participation in regional bodies such as Nairobi Convention and NEPAD generates some ecosystem benefit, however coordination of ASCLMEs is in early stages. Limited environmental benefit from current national management activities.

ASCLMEs Project Component	Cost Category	US\$ Million	Domestic Benefit	Global Benefit
governance reforms and investments needed to institute a shared ecosystem-based approach to managing the LMEs in support of WSSD targets, and foundational capacities are in place for implementation.			greater national level access to donors.	
	GEF Alternative	15.746.5	Improved capacity for management of national marine and coastal resources through stronger institutions, increased resource mobilization, training of national level experts.	Well developed coordination mechanism for regional management; increased resources mobilized through a variety of financial and economic mechanisms to sustain regional management activities; trained experts integrated into work of regional institutions thus increasing regional level capacity and cross-boundary cooperation. Human and financial resource base created for SAP implementation.
	Incremental Cost	5.746.5	GEF: US\$ 3.325 million; ACEP: US\$1.405 million; FAO: US\$.100 million; Govt. Contribution: US\$ .9165 million	
Outcome 4: A <i>Comprehensive Public Participation Initiative Enables Stakeholders to Engage in Programme activities.</i>	Baseline	3.0	Some awareness building and participation in ecosystem management activities through ICZM projects.	ICZM and other ecosystem management projects provide some regional ecosystem benefits but focus is generally national rather than regional level.
	GEF Alternative	6.327	Improved community and national awareness of and improved participation in management of marine resources.	Wider, national and regionally based stakeholder awareness and participation in the management of regional marine resources through outreach and participation Programme.
	Incremental Cost	3.327.5	GEF: US\$ 1.5 million; SA/ACEP: US\$.9 million; EcoAfrica: US\$.5 million; Governments US\$ .4275 million	

**TABLE 15: BASELINE ACTIVITIES BY COUNTRY\***

Country	Source of funds	Project/Agency	Baseline Total (US\$ '000s)	Year
<b>Kenya</b>	Govt.	Kenya Marine and Fisheries Research Institute	7,500	2004-2007

Country	Source of funds	Project/Agency	Baseline Total (US\$ '000s)	Year
	Govt.	Kenya Fisheries Dept. (MOLFD)	2,848	2004-2007
	IUCN	Jakarta Mandate Project	350	2002 – 2005
	USAID	Marine Programme/Coast Development Authority	814	2004-2005
<b><u>Madagascar</u></b>	AFD (France)	Management of Shrimp resources Project	586	2002-2007
	Af.DB	Artisanal Fisheries support	126	2002-2007
	Af.DB	Stock evaluation	150	2002-2007
	ICBG	Centre National de la Recherche Océanographique	79	2003-2005
	Donor	Centre National de Recherches Sur l'Environnement	170	2000-2004
	European Union	MCS Project for Madagascar Fisheries Dept.	1,200	1999-2007
	Govt.	Fisheries budget, fisheries projects, staffing	668	2004-2007
	WCS/ Am. Museum of Nat.History	Cetacean Conservation and Research Programme (CCRP)/ Marine Programme	100	current
	AFD/IRD (France)	National Shrimp Research	68	2002-2004
<b><u>Mauritius</u></b>	IFAD	Rural Diversification Project	1,400	2000-2005
	Japan	Fisheries Training and Extension	6,500	2003-2004
	Government	Mauritius Oceanographic Institute	1,000	current
<b><u>Mozambique</u></b>	NORAD	Fisheries Research Institute	258	2002-2008
	CDE - EU	Fisheries Research Institute	57	2002-2008
	IFAD	Fisheries Research Institute	42	2002-2008
	World Bank	Coastal and Marine Biodiversity Project	260	2004
	France	Fisheries Research Institute	23	2002-2008
	Portugal	Fisheries Research Institute	3	2002-2008
	SADC/EU	Fisheries Ministry	2,000	2001-2006
	JICA	School of Fishery	3,985	
	Spain	School of Fishery	81	2002-2004
	EU	Fisheries Ministry	641	2003-2004
	Government	Fisheries Research Institute	301	2004
<b><u>Regional</u></b>	COI/COMESA	Sustainable Management of Coastal Zones of the Countries of the Indian Ocean	26,000	2005-2010
	EU	Fisheries Data System	358	current
	EU/IOTC	Tuna Tagging Programme	677	current
	France	Monitoring of whales, dolphins and dugong	260	2004-2008
	SIDA	Coral Reef Degradation in the Indian Ocean (CORDIO)	1,056	2004-2008
	France/EU	OSIRIS	2,535	2004-2006
	EU, COI, IOTC	IOTC budget	18,200	
<b><u>Reunion</u></b>	France	THETIS	2,340	2005-2008
	France	CEDTM (Centre d'Etude et de Découverte de Tortues Marines)	874	2004-2007
	France	ECOMAR	156	
	France (IRD, IFREMER)	CAPPES	228	2004-2006
	France/EU	Pelagic ecosystems	358	On going
<b><u>Sevchelles</u></b>	Donor	Reef fish study	100	2002-2006
	France, Belgium, Univ. of Hawaii	FADs As Instruments for Observation (FADIO)	1,430	2002-2006
	Gov. maybe donor	Forestry Coastal Rehabilitation	37	2004
	Seychelles Fishing Authority	Artisanal and Industrial Fisheries Research	1,600	2004
	Donor	SCMRT-MPA	165	2005
	Donor	SCMRT-MPA	233	2005
	UNESCO	Beach Monitoring Programme	3	
	USA	Mooring buoys/marine park	6	
<b><u>Somalia</u></b>	UNDP	Fisheries feasibility assessment	-	2004
<b><u>South Africa</u></b>	Donor	Universities (Cape Town, Kwazulu Natal Rhodes, Stellenbosch, Western Cape, Port Elizabeth)	420	2004
	Donor	Survey of Deepwater Crustaceans - MCM	50	2004/2005
	Donors	SANCOR Sea and Coast Programme	1,512	2004
	France	IRD researchers	625	2004
	Govt.	Overall Fisheries budget	43,848	2005/2006

Country	Source of funds	Project/Agency	Baseline Total (US\$ '000s)	Year
<b><u>Tanzania</u></b>	Govt.	Fisheries budget - MCS, Marine patrol	16,065	2005/2006
	Govt.	Fisheries Budget - Research	13,406	2005/2006
	Govt.	CSIR Coast Programme	1,344	2004
	NORAD	NORSA Bilateral assistance to MCM	1,680	2006-2010
	Donor	Regional Fisheries Arrangement	805	2006
	Govt.	Tanzania Fisheries Research Institute (TAFIRI)	1	2005
	Govt/IDA	MACEMP (Marine and Coastal Env. Management Programme	26,730	2005-2010
	DfID	Fisheries Management for Sciences Programme - FADs and Participatory Fisheries Stock Assessment	160	2004-2005
		Total (ASCLME and SWIOFP)	194,469	

\* Note: The Baseline was calculated for both ASCLME and SWIOFP, the baseline costs associated with SWIOFP activities are approximately US\$111.5 million and approximately US\$ 83 million for ASCL

## PART II: LOGICAL FRAMEWORK ANALYSIS

Long Term Programme/Project Goal			
To ensure the long-term sustainability of the living resources of the two LMEs through an ecosystem based approach to management of the ASCLMEs.			
Project Objective (Purpose)	Performance Indicators (GEF IW Based)	Means of Verification	Assumptions and Risks
to undertake an environmental baseline assessment of the Agulhas and Somali Current Large Marine Ecosystems to fill information gaps needed to improve management decision-making, and to ascertain the role of external forcing functions (such as the Mascarene Plateau and the Southern Equatorial Current). This information will be used to develop a TDA and SAP for the Agulhas Current LME, and a TDA for the southern portion of the Somali Current LME	<ul style="list-style-type: none"> <li>Application of GEF Process, Stress Reduction, and Ecosystem Status Indicators.</li> </ul>	<ul style="list-style-type: none"> <li>Agendas, meeting minutes, publications, and other documentary evidence from the PCU, PSC, PCC, Cruise Coordinating Committee, Science Review Panel, and stakeholder meetings.</li> </ul>	<p>Pressing domestic economic and social issues such as poverty and human health issues imply that regional environmental concerns receive sub-optimal attention and investment.</p> <p>Important local level stakeholders (artisanal fishers, others) will see ecosystem based management efforts as being detrimental to their interests.</p>
<b>Outcome 1: Key</b>	<ul style="list-style-type: none"> <li>One training cruise on the <i>Fritjof Nansen</i> in 2007.</li> </ul>	<ul style="list-style-type: none"> <li>Cruise Data Report in library and pdf</li> </ul>	

Project Objective (Purpose)	Performance Indicators (GEF IW Based)	Means of Verification	Assumptions and Risks
<p>ecosystem assessment and management gaps are filled as necessary to install an ecosystem approach to LME management</p>	<ul style="list-style-type: none"> <li>▪ Four ASCLME funded cruises in key geographic areas of the ASCLMEs, two each in calendar years 2008-09.</li> <li>▪ One <i>Fritjof Nansen</i> cruise in calendar year 2010.</li> <li>▪ Ten cruises of the SA based <i>Algoa</i> from 2007-2010.</li> <li>▪ Over 100 country personnel will have received training in various oceanographic and marine sciences based activities over the life of the project.</li> <li>▪ Approximately 250 country personnel will have received ship/ shore-based training in various oceanographic and marine sciences based expertise.</li> </ul> <p><i>Baseline for the above: At present no ship with the capabilities of the Nansen is available to the countries of the ASCLMEs. No oceanographic and marine sciences based training Programme at regional level, or in many of the participating countries, exists.</i></p> <p>Knowledge gaps in the LME based modules of productivity, fish and fisheries, and pollution and ecosystem health will have been filled in the following geographic areas:</p> <ul style="list-style-type: none"> <li>▪ The Kenyan and Tanzanian coasts;</li> <li>▪ The Mascarene Plateau;</li> <li>▪ The SIDS influenced by the South Equatorial Current;</li> <li>▪ The east coast of Madagascar;</li> <li>▪ The Mozambique Channel; and</li> <li>▪ Other geographic areas to be determined in further consultation with the SWIOFP and WIO-LaB projects as they determine areas to be the subject of cruise activity.</li> </ul> <p><i>Baseline for the above: There are no plans for country or regionally based efforts to fill existing key knowledge gaps in these areas.</i></p> <ul style="list-style-type: none"> <li>• Knowledge gaps in the LME based modules of productivity, fish and fisheries, and pollution and ecosystem health in relation to larval transport, spawning grounds, settlement areas and nurseries will have been filled</li> <li>• Knowledge gaps in the LME based modules of</li> </ul>	<p>files on web site;</p> <ul style="list-style-type: none"> <li>• Records relating to working groups and approved work plans;</li> <li>• Written agreements on joint approaches and methodology for data collection, storage and dissemination;</li> <li>• Written documents on biodiversity and MPA methodologies and training;</li> <li>• Proceedings of workshops</li> <li>• Internationally peer-reviewed documents and publications; Agenda and meeting minutes of PCU, PSC, Cruise Coordinating Committee, Science Review Panel, and stakeholder meetings; Copies of Annual;</li> <li>• Oceanographic Reports on progress addressing oceanographic gaps; Written documents on oceanographic methodologies and training;</li> <li>• Proceedings of workshops</li> <li>• Internationally peer-reviewed documents and publications;</li> <li>• Scientific papers, conferences and reports;</li> <li>• Specific reports on the location and status of spawning, settlement and nursery areas and larval transport trends within the ASCLMEs region</li> <li>• Specific reports on the status and impacts of artisanal and subsistence fisheries</li> <li>• Protocols developed for the measurement of POPs in indicator species.</li> <li>• Written reports of the results of POPs measurements in indicator species.</li> <li>• Incorporation of results of POPs levels</li> </ul>	<p>Assumes countries continue to see the value in providing the personnel and in-kind support resources necessary to accomplish the activities in this Outcome (countries have committed themselves to these in-kind costs).</p> <p>Assumes estimated costs of research vessels are not overtaken by inflation or exchange rate fluctuations (the project has built in adjustments for these).</p>

Project Objective (Purpose)	Performance Indicators (GEF IW Based)	Means of Verification	Assumptions and Risks
	<p>productivity, fish and fisheries in relation to artisanal and subsistence fisheries will have been filled</p> <ul style="list-style-type: none"> <li>▪ By 2010 data and information from the cruises and other activities in this Outcome will synthesize and made available to all stakeholders.</li> <li>▪ By 2009 baseline information will have been gathered on Stockholm related POPs loadings in key indicator species.</li> <li>▪ By 2010 data and information from the POPs related activity will have been synthesized and made available to all stakeholders.</li> </ul> <p><i>Baseline: No marine related POPs work is currently undertaken in the ASCLMEs. France is undertaking work related to heavy metal concentrations in seabird populations. This activity will complement the effort of France.</i></p>	<p>in indicator species in Stockholm Convention related reports of the countries.</p>	
<p><b>Outcome 2:</b> Decision-making tools are in place, to facilitate the synthesis and application of data for LME management purposes</p>	<ul style="list-style-type: none"> <li>• By 2010 GIS capability in the region will have been increased by 25%</li> <li>• By 2010 over 100 country personnel will have been trained in GIS techniques and developed a range of products for the project, Programme and for the general benefit of the countries and region.</li> <li>• By 2010 GIS products will have been stored in the country-selected repository for general use by all stakeholders.</li> </ul> <p><i>Baseline: The ACEP has been active in promoting and using GIS technology within the countries of the ASCLMEs and to the general benefit of the region. Countries have limited GIS country-based capacity. No regional integration of GIS products is being undertaken by any stakeholders in the region.</i></p> <ul style="list-style-type: none"> <li>• Development of clear and agreed upon protocols (PI).</li> <li>• <i>Baseline: As there is no integrated and comprehensive regionally based ASCLMEs effort no regionally based M&amp;E protocols exist.</i></li> <li>• Establishment of specific arrangements for coordinated M&amp;E activities with SWIOFP, WIO-LaB, ACEP, and</li> </ul>	<ul style="list-style-type: none"> <li>• Membership lists of key committees and sub-committees.</li> <li>• Copies of Terms of Reference for committees and sub-committees</li> <li>• Minutes of meetings</li> <li>• Committee and sub-committee reports and recommendations</li> <li>• Copies of agreements and minutes of joint meetings with other Programme projects and related entities undertaking Programme and project related M&amp;E activities.</li> <li>• Agenda and meeting minutes of PCU, PSC, Cruise Coordinating Committee, Science Review Panel, and stakeholder meetings</li> </ul>	<p>An assumption is that related Programme projects, and the related projects of the countries themselves and of other bi-lateral and multi-lateral donors will see it in their best interest to cooperate in M&amp;E activities (A broad range of M&amp;E stakeholders regionally and internationally have been actively consulted during preparation).</p> <p>A risk is that countries will not have the requisite political will and/or resources to continue ecosystem based M&amp;E activities post-Programme and project.</p>

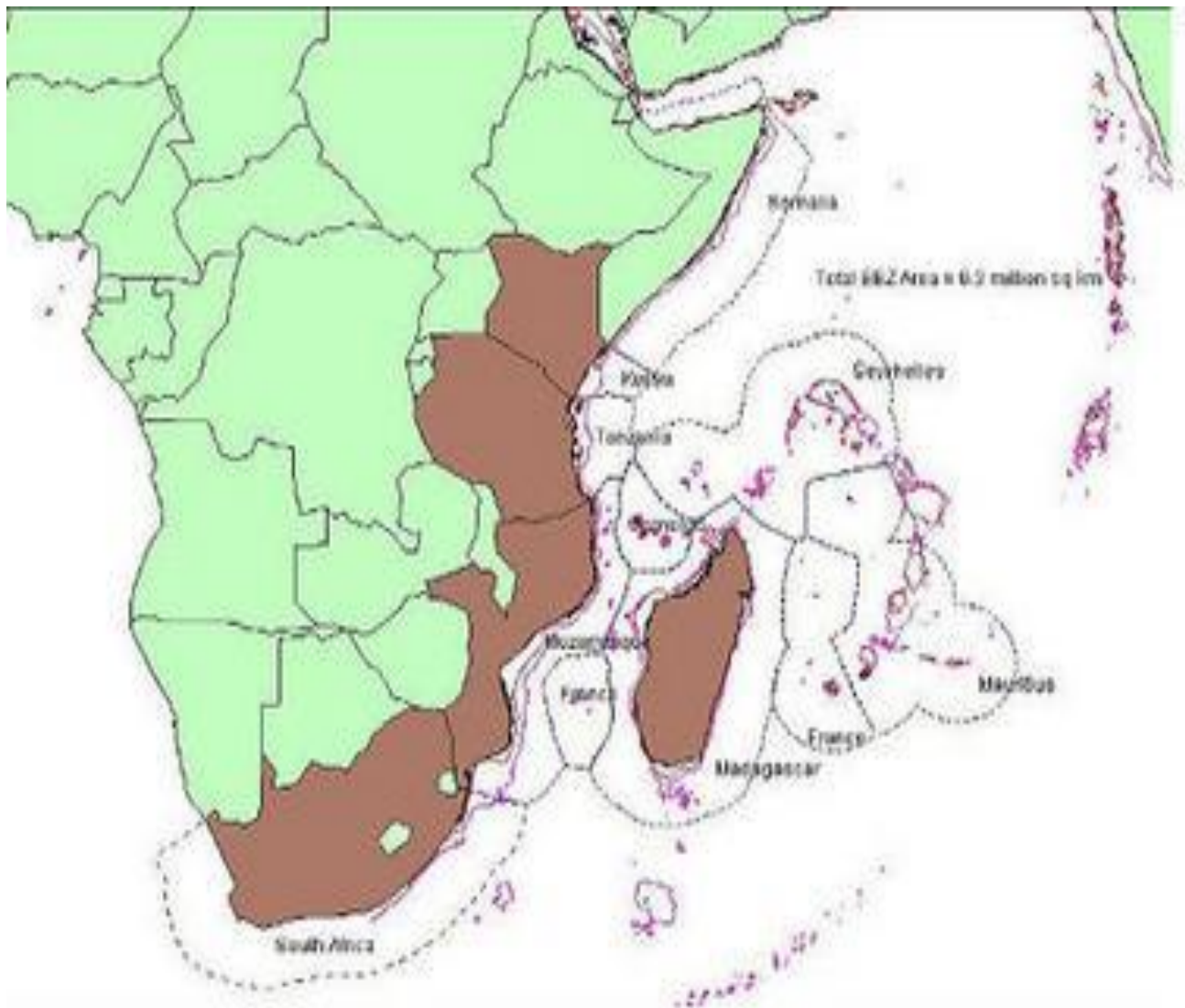


Project Objective (Purpose)	Performance Indicators (GEF IW Based)	Means of Verification	Assumptions and Risks
	<p>other entities involved in related M&amp;E activities (PI).  <i>Baseline: There is no regional level coordination of M&amp;E efforts within the ASCLMEs.</i></p> <ul style="list-style-type: none"> <li>Definitive set of GEF IW based PI indicators are developed and refined (PI indicators largely developed during preparation and reflected in this LogFrame).</li> </ul> <p><i>Baseline: As above, there is no integrated M&amp;E effort.</i></p> <ul style="list-style-type: none"> <li>Clearly defined set of SRIs and ESIs developed by month 18 of project implementation.</li> </ul> <p><i>Baseline: As above.</i></p>		
<p><b>Outcome 3:</b>  Regional agreement is reached on transboundary priorities and their root causes and a suite of governance reforms and investments needed to institute a shared ecosystem-based approach to managing the LMEs in support of WSSD targets, and foundational capacities are in place for implementation.</p>	<ul style="list-style-type: none"> <li>Establishment of Project Steering, Programme Coordination, and other Project level committees and establishment of a PCU (PI).</li> <li><i>Baseline: No "hands-on" regional coordinating mechanism exists, as the Nairobi Convention is not an operational entity.</i></li> <li>Provision for coordinated funding of donor recruitment activities (PI).</li> <li><i>Baseline: At present donor activities in the region are ad-hoc and fragmented.</i></li> <li>CB&amp;T is refined and approved (PI).</li> <li><i>Baseline: There is at present no regionally based. CB&amp;T strategy</i></li> <li>Workshop to determine institutional and organizational capacity building needs (PI).</li> <li><i>Baseline: There has been no overview assessment of regional organizations and institutions and none are planned with exception of the Project.</i></li> <li>Workshop to determine human (training) capacity needs (PI).</li> <li><i>Baseline: No overall determination of human capacity building needs has been undertaken in the region or in any of the participating countries.</i></li> <li>Deliberate training (human capacity building) is scheduled (PI).</li> </ul>	<ul style="list-style-type: none"> <li>Committee membership lists and copies of committee meeting minutes.</li> <li>Reports of the PCU regarding the extent and results of specific donor and other funding related consultations.</li> <li>Copies of course training manuals.</li> <li>Lists of country participants and training targets as part of each cruise plan.</li> <li>Copies of Workshop agendas, invitation lists, and written workshop reports.</li> <li>Numbers of people trained.</li> <li>Copies of country approaches to retain trained personnel.</li> <li>Written records of discussions leading to eventual adoption of funding mechanisms aimed at sustaining post-SAP activity.</li> <li>Specific provisions in the SAP to assure post-Programme and post project funding to ensure sustainability.</li> <li>Changes in or additions to existing Programmes such as fish levies to demonstrate country commitment to</li> </ul>	<p>Conflict between coastal states with different political agendas results in an inability of countries participating in regional activities to cooperate at the level needed to achieve results.</p> <p>There will be insufficient numbers of regionally based experts to fulfil training needs necessary to build individual capacities in the region</p>

Project Objective (Purpose)	Performance Indicators (GEF IW Based)	Means of Verification	Assumptions and Risks
	<ul style="list-style-type: none"> <li>• <i>Baseline: Training is ad-hoc both at national and regional levels.</i></li> <li>• Options paper for selection of regional entity or entities to assume regional level responsibility for post SAP related work.</li> <li>• <i>Baseline: At present there is a plethora of regional organizations with fragmented mandates and incomplete or absent operational responsibilities.</i></li> <li>• Regularized meetings of the PCC to assure strong IA collaboration as a base for ensuring strong Programme coordination with governments, related GEF projects, and other regional stakeholders (PI).</li> <li>• <i>Baseline: No such activity has taken place nor is one scheduled.</i></li> </ul>	sustainability.	
<p><b>Outcome 4:</b> a comprehensive public participation initiative enables stakeholders to engage in Programme activities.</p>	<ul style="list-style-type: none"> <li>• Distribution of “lessons learned” to other Programme projects and related organizations (PI).</li> <li>• Distance courses developed and distributed (PI).</li> <li>• ICT platform designed and running (PI).</li> <li>• Development of 100 information nodes at Universities in the region and within CBOs (PI).</li> <li>• Modules and courses prepared and distributed (PI).</li> <li>• Pilot Phase implemented in 50 nodes (PI).</li> <li>• Database creation made available on project website (PI).</li> <li>• Production of 10 educational and public interest films related to the project and Programme (PI).</li> <li>• 6 project/Programme related travelling exhibitions (PI).</li> <li>• 4000 students given tours and basic science overview on research vessels (PI).</li> <li>• 10,000 teachers will have received project and Programme related instructional materials (PI).</li> </ul> <p><i>Baseline: No comprehensive public participation Programme exists for the region.</i></p>	<ul style="list-style-type: none"> <li>• Copies of reports of “lessons learned”</li> <li>• Hiring of IT staff</li> <li>• Written M&amp;E plan including explicitly identified indicators.</li> <li>• List of participating universities.</li> <li>• Written description of portal design and written verification of portal locations.</li> <li>• Training manuals for IT staff and numbers and locations of IT staff trained.</li> <li>• Written course books.</li> <li>• Initiatives review document.</li> <li>• Published list of coastal stakeholders and description of methodology used in identification of stakeholders.</li> <li>• List of designated DLIST partners.</li> <li>• List of DLIST focal points.</li> </ul>	<p>An assumption is that related projects and organizations will be amenable to cooperation with the DLIST activity.</p> <p>A risk is that coastal players will not have trust levels in the Programme and projects sufficient to become engaged.</p>

### SECTION III. ATTACHMENTS

#### ANNEX 1: MAP OF PARTICIPATING COUNTRIES WITH EEZ MAPPING.



Map of ASCLMEs Countries showing political boundaries and their 200-mile Exclusive Economic Zones.

## ANNEX 2: A SUMMARY OF OCEANOGRAPHIC KNOWLEDGE IN THE AGULHAS AND SOMALI CURRENT LMEs

### Introduction

The oceanographic conditions in the Agulhas and Somali Current LMEs (ASCLMEs) are distinctly disparate. In the southern part of the West Indian Ocean the Agulhas Current system dominates. This current is one of the largest western boundary currents in the world and is fed from a range of complex sources. The Somali Current in the northern part of the West Indian Ocean is by contrast a shallow current that has the unusual characteristic that it reverses direction with season. The currents that carry water past the islands of the South-west Indian Ocean in turn form part of the typical, wind-driven, subtropical gyre.

Knowledge on the oceanography of these different systems; physical, chemical, biological and geological, is equally diverse. Parts of the Agulhas Current system have been comprehensively studied; others - particularly in the Mozambique Channel and around Madagascar - remain largely unknown. Aspects of the Somali Current have been relatively thoroughly observed in the past, but studies close inshore have ceased for security reasons. Few dedicated studies have been undertaken in the vicinity of most of the islands of the South-west Indian Ocean. The influence of all these currents on the circulation over adjacent shelves, the local chemistry, biology and the sediment movement has all been extremely sparsely investigated.

This compact summary of what is known about the oceanography of the West Indian Ocean is strongly skewed towards physical oceanography. The reason for this is easily explained. Considerably less is known about the chemistry, the biology and the geology of the region than about the physics. In many coastal regions no observations in support of these non-physical sub-disciplines have to date been made.

Full, detailed and up-to-date reviews of all that is known about the coastal oceans of the ASCLMEs region have just been published in the international journal *The Sea* and extend and complement this brief synopsis for the interested reader.

### Agulhas Current system

The Agulhas Current system may be considered to consist of three components: a source region, the northern Agulhas Current proper and the southern Agulhas Current. The sources of the Agulhas Current are the subtropical gyre of the South Indian Ocean, the region east of Madagascar and the Mozambique Channel. Of these the subtropical gyre is the main contributor by volume. The flow through the Mozambique Channel consists largely of intense, anti-cyclonic eddies that are formed in the narrows of the channel and that move poleward from there. These eddies may be 200 km in diameter and extend all the way to the sea-floor. Their influence on adjacent shelf regions is not known.

Between the narrows of the channel and the Comores Islands the flow seems to be in the form of an anti-cyclonic gyre, but this conclusion is based on very few observations and the flow may in fact be quite variable. The currents on the eastern side of the channel, outside the direct influence of the Mozambique eddies, are unknown. There are some observations that suggest a net southward movement, but other measurements indicate a northward movement. Remote sensing data have shown the presence of weak eddies in this region that draw water off the shelf. Whether this is an important process from a chemical and biological point of view is not yet known. In fact, there are no published observations of currents on this shelf region whatsoever.

The flow along the east coast of Madagascar is equally poorly known. A fast and intense current, the East Madagascar Current, carries water along the edge of the narrow continental shelf. The southern

part of this current goes poleward; the northern component equatorward. The location of the bifurcation is not known with any degree of accuracy. Since the shelf is so narrow it may be assumed that the water on the shelf moves in sympathy with the juxtapositioned current, but to date there are no observations to adequately support this hypothesis. Both along the shelf of Mozambique and the shelf of Madagascar upwelling cells with enhanced nutrient contents have been observed. These include a cell at Angoche on the Mozambican coast and along the southeast coast of Madagascar. The intensity and the persistence of these cells, as well as their biological impact, remain to be determined.

The northern Agulhas Current seems to start somewhere between the cities of Durban and Maputo, according to evidence gleaned from the movement of sediments on the adjacent shelf. The current is strong, intense and increases in depth and in volume flux downstream. Maximum velocities exceed 2 m/s on its inshore side; the current being 60 to 100 km wide with an intense inshore edge but a more diffuse offshore border. The current follows the shelf edge quite closely, diverging from the coastline where the continental shelf is wide, such as at the Natal Bight. In general the trajectory of the current is unusually stable for a current of this nature, the exception occurring during the passage along the current of a Natal Pulse. This singular meander commences at the Natal Bight and from there moves down the current at about 20 km/day, growing in amplitude. The coastal effect of the passage of a Natal Pulse is a sudden, but short-lived reversal in current directions. On the whole the water movement on the adjacent shelf is parallel and in the same direction as the northern Agulhas Current. There are two exceptions: directly south of Durban and over the Natal Bight. South of Durban there is a persistent lee eddy that may be carried off in an incipient Natal Pulse; on the Natal Bight the water movement may be largely dependent on the reigning wind.

At the northern tip of the Natal Bight there is a concentrated and persistent upwelling cell that probably supplies a major part of the bottom water for this part of the shelf. It enhances the local nutrient supply and leads to a marked increase in local phytoplankton density. The precise role of this point source of nutrients for the ecosystem of the region has not been studied.

The path of the southern Agulhas Current – downstream of the city of Port Elizabeth - is much less stable, exhibits meanders as well as attendant shear edge eddies and plumes. It flows past the wide Agulhas Bank and has a decisive influence on this shelf's water masses. At the eastern corner of the Agulhas Bank there is a persistent upwelling cell. It has been inferred that this cell supplies all the nutrient rich bottom water for the bank. It also enhances the seasonal thermocline. This process may be crucial for the successful spawning of the major pelagic fish species that have been shown to preferentially produce their eggs on this bank. From here the larvae and sprat move to the Benguela upwelling system of the South Atlantic Ocean to support the largest fisheries of the region – therefore a true transboundary ecosystem.

### **Somali Current**

Directly north of the Mozambique Channel, the northward setting current along the coast of the African continent is called the East African Coastal Current. It has as its main source the northern part of the westward flowing South Equatorial Current. During the North-east Monsoon season the East African Coastal Current is opposed by the southward flowing Somali Current and this meeting point usually shifts southward as the season progresses. It is only the surface expression of the East African Coastal Current that is prevented from moving northward; at depth the current continues as an undercurrent below the Somali Current. The North-east Monsoon occurs during the months of December to April, being strongest in February. During the opposite wind phase, the South-west Monsoon season (June to October, maximum in August), the East African Coastal Current is strengthened considerably and forms the main tributary to the Somali Current which during this period carries water northward in an intense coastal jet. Speeds in this jet may reach very high values of up to 3.5 m/s. The southern part of the current is shallow. Farther to the north it deepens.

The northward flow of the Somali Current during the South-west Monsoon season is not simply alongshore. The flow turns offshore at about 3 ° N. North of this point a strong upwelling cell has

been observed to develop. The biological effect of this transitory upwelling cell has not been adequately studied. Two coastal gyres are then created at the sides of this upwelling cell. These gyres seem characteristic of the flow during the beginning of this season. As the season advances, these upwelling gyres shift northward, join together and by the time of the most intense part of the South-west Monsoon in August the Somali Current is established as a continuous western boundary current from the East African Coastal Current in the south to the East Arabian Current in the north.

The monsoonal wind patterns vary somewhat from year to year and so will, in consequence, the seasonal development of the Somali Current. This inter-annual variability may have a decisive influence on the shelf circulation, on the marine ecosystem of the region and also on the success of the local fisheries. This variability has not been studied in a multi-disciplinary way. In general the coastal currents and the effect of offshore currents on the shelf area inshore of the Somali system have also been investigated in a very patchy and inadequate way. Long-term monitoring of currents, water masses and biota has been deficient.

### **Islands**

The islands of the South West Indian Ocean that lie east of Madagascar (i.e. excluding those in the Mozambique Channel and the Comores) all basically lie in the path of the South Equatorial Current. This wind-driven current is shallow and is considered not to change much in strength or direction, either seasonally or inter-annually. However, this conclusion may be the consequence of insufficient observations in the region. The effect of the passing water masses on the narrow shelf regions of most of the islands is not well known, but can be assumed to be a function of their offshore bathymetry and the absence or presence of coral reefs. The flow of the South Equatorial Current over the Mascarene Ridge that lies between Mauritius and the Seychelles has been established only recently. This shallow obstruction to the westward flow causes the current to be concentrated into a number of narrow jets through the deeper parts of the ridge. A seasonal phytoplankton bloom commences along the eastern coast of Madagascar with the onset of winter and progresses as a productivity wave eastwards as the seasonal thermocline deepens and nutrients from below are made available in the euphotic zone.

There is another important perturbation to the envisaged steady and invariant nature of this component of the ASCLMEs. It has been shown that meridional meanders in the South Equatorial Current travel westward as Rossby waves. Embedded in them are eddies. These eddies intensify as they move westward and may have a decisive influence on the ocean circulation of the islands they pass. It has been demonstrated that they, and eddies that come from the Mozambique Channel, may eventually reach the Agulhas Current and trigger Natal Pulses with all the attendant affects of current changes.

### **Climate impacts and climate change**

One of the reasons why international interest in the ASCLMEs region has grown over the past decade has been the general recognition that this ocean region plays a key role in global climate. The leakage of warm water from the Agulhas system into the South Atlantic Ocean is the mechanism that has attracted most attention. This leakage seems to be controlled by mesoscale processes in the source regions of the Agulhas Current about which insufficient information is currently available. Coastal currents also affect the rainfall over the adjacent continental landmasses and changes in these currents will therefore have an impact on such terrestrial precipitation. This process is currently under investigation using numerical models.

Climate change may furthermore affect the frequency and intensity of extreme events such as hurricanes. This will be of crucial importance for ASCLMEs countries such as Madagascar and Mozambique. Sea level rise will cause increased erosion of soft coastal plains and may have therefore have substantial effects on low lying areas such as a major part of central Mozambique. Last, but not least, increased acidification of sea water as more carbon dioxide is absorbed may cause increased

bleaching of corals that could have lasting effects on coastal regions of a number of ASCLMEs countries.

### **Conclusions**

The transboundary ecosystems of the West Indian Ocean, their dependence on their physical, chemical and geological environment and the possible effect of climate change on these interrelated systems all remain largely unknown. This holds true for the Agulhas Current system, the Somali Current system as well as the Mascarene Plateau and the associated islands of the South-west Indian Ocean. In order to establish some criteria for the proper management of these ecosystems, exploratory investigations are required to establish essential baseline information.

**ANNEX 3: LINKAGES BETWEEN ASCLMEs PROJECT AND NATIONAL DEVELOPMENT PLANS**

Country	Development Plans, Strategies and Legislation	ASCLME Linkages
Comoros	<ul style="list-style-type: none"> <li>• Comoros National Environment and Policy and Environmental Action Plan under development</li> <li>• National Biodiversity Strategy and Action Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Regional Commissions for sustainable development being established on each island.</li> <li>• Programmes under development to monitor the state of coral reefs and monitor eco-toxicity levels in marine environment.</li> </ul>
Kenya	<ul style="list-style-type: none"> <li>• National Economic Recovery Plan (ERP), 2003/2004</li> <li>• Environmental Management Plan</li> <li>• Maritime Zones Act, 1991</li> <li>• Fisheries Act, 1991</li> <li>• Fisheries Regulations, 1991</li> </ul>	<ul style="list-style-type: none"> <li>• Contributes to ERP objectives of increasing economic growth through sustainable management of resources.</li> <li>• Complements on-going fisheries management initiatives and objectives, which include: i) general encouragement of responsible fishing practices and co-management structures; ii) curtailment of destructive fishing methods; iii) further development of Marine Protected Areas (MPAs) with both park (non-fishing) and reserve (fishing restrictions) sectors; and iv) resolution of local conflicts related to use of fisheries resources</li> </ul>
Tanzania	<ul style="list-style-type: none"> <li>• Poverty Reduction Strategy Paper, 2000</li> <li>• Tanzania Vision 2025</li> <li>• Fisheries Policy and Strategy, 1997</li> <li>• National Integrated Coastal Environmental Strategy Act, 2003</li> <li>• Blueprint 2050, 2005</li> </ul>	<ul style="list-style-type: none"> <li>• Contributes to Government policy to exploit fishery resources in a sustainable manner in order to enhance food security by increasing the availability of animal protein on local markets, and to create employment for local populations.</li> <li>• Meets objectives recently elaborated in coastal and marine management strategies to improve coastal management, increase co-management and community involvement, and expand the networks of MPAs</li> </ul>
Mauritius	<ul style="list-style-type: none"> <li>• The Fisheries and Marine Resources Act</li> <li>• Environment Protection Act (EPA)</li> <li>• Continental Shelf Act</li> </ul>	<ul style="list-style-type: none"> <li>• Provides general enforcement and compliance measures for protection of the aquatic ecosystem against pollution, exploitation of mangroves, construction of any structures etc; deals with marine protected areas in Mauritian waters including associated land area (new); and establishes an MPA Fund and conservation measures.</li> <li>• Establishes management plans, monitoring coastal waters and creates management plans and monitors coastal waters. Also provides for measures to prevent pollution in CZ.</li> <li>• Provides for measures for the protection of living marine resources.</li> </ul>
Mozambique	<ul style="list-style-type: none"> <li>• Programme do Governo 2000 – 2004</li> <li>• Política Pesqueira e Estratégias de Implementação (PPEI)</li> <li>• Law of Fisheries, 1990</li> </ul>	<ul style="list-style-type: none"> <li>• Promotes overall goal of national fisheries management of ensuring the preservation of the fishery resources while maximizing economic income for the country</li> <li>• Will help improve the knowledge base that underpins national fisheries regulation by providing more information for the Government’s existing system of fishing quotas</li> <li>• Will complement national efforts to promote the involvement of the coastal communities in the exploitation and management of living aquatic stocks in order to take advantage of local management know-how and facilitate the introduction of biologically sustainable natural resources</li> </ul>



Country	Development Plans, Strategies and Legislation	ASCLME Linkages
		usage patterns that can be both socially and economically efficient.
Seychelles	Environment Management Plan for Seychelles (EMPS 2000-2010)  Fisheries Policy, adopted in March 2005	<ul style="list-style-type: none"> <li>• Integrated ecosystem conservation approaches, management of MPAs, management of coastal pollution</li> <li>• Promotion of sustainable and responsible fisheries development and optimising the benefits from the sector. Facilitating management to ensure responsible fishing and the effective protection of the marine ecosystem.</li> </ul>
South Africa	<ul style="list-style-type: none"> <li>• Marine Living Resources Act, 1998</li> </ul>	<ul style="list-style-type: none"> <li>• Provides for the conservation of the marine ecosystem, the long-term sustainable use of marine living resources and the orderly access to exploitation, utilization and protection of certain marine living resources; and also to exercise control over harvesting marine living resources in a fair and equitable manner to the benefit of all the citizens of South Africa.</li> <li>• Contributes to higher goal of national marine fisheries policy, which is to contribute to the long-term vision for a democratic South Africa through a competitive, fast-growing economy which creates sufficient jobs for all work-seekers; a redistribution of income and opportunities in favour of the poor</li> <li>• Improve the knowledge base underpinning management of commercial fisheries operations, particularly as fishing effort has increased substantially after restructuring of the industry in the 1990s</li> <li>• Complements national efforts to assess vulnerable stocks and designate Marine Protected Areas (MPAs) for the purposes of scientific study, experimental fishing or conservation.</li> </ul>
Madagascar	<ul style="list-style-type: none"> <li>• Poverty Reduction Strategy Paper 2003</li> <li>• Fisheries and Aquaculture Ordinance 1993</li> <li>• Rural Development Action Plan (PADR)</li> </ul>	<ul style="list-style-type: none"> <li>• Contributes to overall goal of national fisheries management which is to contribute to: i) improvement of rural livelihoods; ii) the fight against poverty; iii) improvement in food security, particularly deficits in animal protein; iv) improved export receipts and volumes; and v) employment creation</li> <li>• Supports national efforts to establish a management system based on analysis of sustainable catch</li> <li>• Complements efforts to renew overexploited stocks and monitor fishing pressure</li> </ul>

#### ANNEX 4: THREATS MATRIX

Threats	Management Issues/ Key Barriers	Solutions: Interventions from Programme Barrier Removal Activities (PRE / SAP Implementation)
<p>Human induced habitat destruction and alteration of the marine environment including destruction of mangroves, coral reefs, and sea grass beds</p>	<p><b><u>Ultimate Causes (beyond scope of Programme)</u></b></p> <p>Marine environment under stress due to: Increased population and rapidly developing coastal cities, commercial ports and industrial centers and infrastructure (ultimate cause, beyond project scope);</p> <p><b><u>Intermediate Causes (for pre SAP/ SAP intervention)</u></b></p> <p>Incomplete knowledge of type, scale and consequences of threats facing marine environment, and basic lack of understanding of oceanographic processes making difficult or impossible creation of adaptive management regimes (i.e. conservation of critical habitats providing source populations for recruitment of fish and invertebrates throughout the region).</p> <p>National management regimes, with some exceptions, lack capacity, both financial and human, to effectively manage marine resources</p> <p>Regional management of resources emerging but not yet fully functional due to institutional issues, legal framework, coordination problems, and lack of capacity</p> <p>Numerous but uncoordinated management efforts to address different aspects of the marine environment</p>	<p>Improved knowledge of status of marine resources and identification of key threats through filling of priority data and information gaps;</p> <p>Improve knowledge base on the determinants of habitat degradation in the SWIO and the scale of the problem</p> <p>Development of more effective regional coordination and management mechanisms to build regional capacity and create adaptive management strategies at regional level</p> <p>Adoption of an ecosystem approach to management of marine resources</p> <p>Improve interactive public awareness and participation in management of marine environment and create effective environmental education and marine science based educational initiatives</p>
<p>Pollution of the Marine Environment</p> <p>Decreased water quality as a result of pollution generated by runoff from agricultural lands and discharge of sewage, industrial effluents and other harmful substances into waterbodies.</p>	<p><b><u>Ultimate Causes (beyond scope of Programme)</u></b></p> <p>Low levels of socio-economic development that prevent coastal communities from adopting more sustainable economic or settlement practices (ultimate cause, beyond project scope)</p> <p><b><u>Intermediate Causes (for pre SAP/ SAP intervention)</u></b></p>	

Threats	Management Issues/ Key Barriers	Solutions: Interventions from Programme Barrier Removal Activities (PRE / SAP Implementation)
<p>Reduced flow of freshwater into rivers and estuaries due to increased demand for freshwater resources for human settlements.</p> <p>Changes in the physical structure of coastal and marine areas affecting rates of siltation, and nutrient availability caused by deforestation</p>	<p>Lack of cooperation at the regional level to address human causes of habitat degradation that affect the regional environment.</p> <p>Lack of planning and poor integration of various public institutions with mandates covering use or management of marine and coastal environment.</p> <p>Unplanned urbanization and lack of appropriate infrastructure</p> <p>Information on biodiversity in the ASCLMEs including habitats, threats, connectivity, taxonomy etc is incomplete.</p> <p>Poor implementation of or lack of appropriate regulatory tools to better manage marine and coastal environment.</p> <p>Lack of awareness or low level of public involvement in management</p>	<p>Adoption of management and coordination mechanisms to reduce pollution within and across national boundaries</p> <p>Identification of pollution hotspots and adoption of strategies to address hotspots</p> <p>Awareness raising and identification of strategies to reduce stress on important marine and coastal habitats</p>
<p>Overexploitation of nearshore and offshore fisheries resources</p> <p>Commercial fisheries not constrained by sustainable catch limits in some countries</p> <p>Valuable offshore fisheries are harvested predominantly by distant-water fishing fleets from Europe and eastern Asia and the proportion of unreported catches is largely unknown.</p> <p>As fish stocks elsewhere in the world are diminishing, more fleet operators are certain to turn their attention to the commercial fish stocks along the east African coast until these stocks have</p>	<p><b><u>Ultimate Causes (beyond scope of Programme)</u></b></p> <p>Low levels of socio-economic development that cause countries and communities to exploit resources for short-term gain (Strong incentive to fully exploit fisheries resources as they provide significant source of revenue, employment and food to ASCLMEs countries)</p> <p><b><u>Intermediate Causes (for pre SAP/ SAP intervention)</u></b></p> <p>Incentives to manage transboundary stocks within national waters low without reciprocal and coordinated actions by other countries</p> <p>Regional management structures are beginning to emerge but not yet fully functional. Transactions costs to regional management are high and resources to engage in management activities are limited</p> <p>Inadequate information about the species composition, distribution, behavior and migration patterns of non-commercial and commercial fish stocks in the SWIO. Inadequate information on the extent to which</p>	<p>Improve knowledge base of ASCLMEs by establishing baseline indicators and stock dynamics for key fisheries.</p> <p>Define elements of sustainability for key stocks</p> <p>Improve capacity for national management of fisheries resources by linking management and science, improving national monitoring capacity, and building up human resource</p>

Threats	Management Issues/ Key Barriers	Solutions: Interventions from Programme Barrier Removal Activities (PRE / SAP Implementation)
<p>been exhausted and catches are no longer economically viable.</p>	<p>commercial marine resources are fully exploited within the EEZs of SWIO countries</p> <p>Lack of appropriate regulations and enforcement power to establish sustainable yields in commercial fisheries</p> <p>Management and research are not always integrated – management decisions sometimes not underpinned by scientific findings</p> <p>Short term or species specific perspective used in managing fisheries resources – lack of ecosystem approach</p>	<p>capacity</p> <p>Improve capacity for regional management by identifying institutional and legal framework for effective coordination</p> <p>Promote adoption of ecosystem approach to fisheries management</p>
<p><i>Unnecessarily high by-catch and incidental mortality of marine fauna in commercial fisheries operations</i></p> <p>Commercial fisheries rely on gear technology and fishing practices that result in excessive levels of by catch and incidental mortality. Fisheries operators have little incentive to reduce by catch or incidental mortality, particularly as efforts to do so may reduce overall fisheries catch</p>	<p><b><u>Intermediate Causes (for pre SAP/ SAP intervention)</u></b></p> <p>Inadequate information about the extent of by-catch or mortality of various species</p> <p>Regulations protecting threatened species or areas under pressure are weak</p> <p>Monitoring capacity low and regulatory enforcement power weak</p> <p>Limited availability of appropriate technology such as excluding devices</p>	<p>Gear design and improved technology dissemination</p> <p>Awareness raising and identification of mitigation strategies for species under threat</p> <p>Development of baseline for key species under threat</p> <p>Adoption of ecosystem approach in fisheries management</p>
<p><i>Adverse consequences related to poor understanding of environmental variability within LMEs</i></p> <p>High level of environmental variability and complexity in Agulhas and Somali LMEs result in environmental interactions and perturbations that affect living resources and marine habitats. Inability to differentiate between anthropogenic and</p>	<p><b><u>Ultimate Causes (beyond scope of Programme)</u></b></p> <p>Anthropogenic climate forcing and sea level rise</p> <p><b><u>Intermediate Causes (for pre SAP/ SAP intervention)</u></b></p> <p>Incomplete information about environmental variability within the ASCLMEs - key data gaps still exist in areas of oceanographic dynamics: Remote sensing, size fractionation of chlorophyll a, primary production, food webs, bathymetry, geology and sedimentology, and geophysical characteristics of the ASCLMEs.</p>	<p>Improve understanding of environmental variability in ASCLMEs</p> <p>Distinguish between anthropogenic and environmental impacts on ecosystem health in national and regional management efforts</p>

<b>Threats</b>	<b>Management Issues/ Key Barriers</b>	<b>Solutions: Interventions from Programme Barrier Removal Activities (PRE / SAP Implementation)</b>
<p>environmental impacts can result in poor decision-making and ineffective targeting of management efforts. Negative impacts of environmental induced changes to ecosystem from likely anthropogenically induced climate change (sea level changes, increased ocean temperature, alteration of salinity levels, coral bleaching events) not fully understood making adaptive management impossible.</p>	<p>Inadequate differentiation between environmental and anthropogenic impact on the marine environment within framework of national and regional management initiatives</p> <p>Partial understanding of climate change and its impact on ASCLMEs</p>	<p>Raise awareness and publicize link between climate change related threats to marine environment and anthropogenic threats</p> <p>Create interactive capability among stakeholders as a means of identifying and mitigating environmental threats and aiding in creation of adaptive management capability at national and regional levels</p>

## ANNEX 5: SUMMARY OF SWIOFP AND WIO-LAB PROJECTS

### GEF-WORLD BANK- SOUTHWEST INDIAN OCEAN FISHERIES PROJECT

**Global Objective:** To promote the environmentally sustainable use of fish resources and adoption of an ecosystem approach to fisheries management in the Agulhas and Somali LMEs.

**Development Objectives:**

- i) To identify and study exploitable offshore fish stocks within the SWIO, and more specifically to become able to differentiate between environmental and anthropogenic impacts on shared fisheries
- ii) To develop institutional and human capacity through training and career building.
- iii) To develop a regional fisheries management structure and associated harmonized legislation in collaboration with the Southwest Indian Ocean Fisheries Commission (SWIOFC).

### **Outputs and Activities**

#### **Component 1: Data gap analysis, data archiving and information technology**

This component will establish a regional data management system managed by staff of the Regional Coordination Unit (with skills specific to this task) to underpin management of regional fisheries and undertake a gap analysis to identify the specific research activities to be supported by the project.

**Outputs** include:

- A. An analysis at national and then at a regional level of data relevant to components in which it will participate and identification of specific gaps in existing data that would collectively form the gap analysis used to identify the data collection Programme facilitated by SWIOFP; and
- B. A workshop consisting of all SWIOFP countries at which a conceptual, harmonized, data gap analysis (by type of fishery, i.e. demersal, pelagic, invertebrate) will be undertaken leading to synthesis of a year-by-year data collection Programme.

#### **Component 2: Assessment and sustainable utilization of crustaceans**

This component will undertake an assessment of the stock dynamics of shallow and deep-water crustaceans and their fisheries. Using ship-based surveys, baseline assessment of crustacean stocks and fisheries will be undertaken. **Outputs** include:

- A. Transboundary diagnostic identifying the current status of important species, threats matrix, and regional/sub-regional management issues and needs; and
- B. Preparation and adoption of a Strategic Action Plan for each fishery detailing how each relevant country will address issues identified in the component TDA
- C.

#### **Component 3: Assessment and sustainable utilization of demersal fishes (excluding crustaceans)**

This component will support assessment of the stock dynamics of demersal species and their fisheries. Ship-based surveys will be used to undertake a baseline assessment of demersal stocks and fisheries and evaluate demersal fisheries by-catch, discard impacts, exclusion devices, and ecosystems.

**Outputs** include:

- A. Transboundary diagnostic identifying the current status of important species, threats matrix, and regional/sub-regional management issues and needs; and
- B. Preparation and adoption of a Strategic Action Plan for each fishery detailing how countries will address issues identified in the component TDA.

#### Component 4: Assessment and sustainable utilization of pelagic fish

This component will assess the stock dynamics of large, small, and mesopelagic species and develop strategies to optimize small- and large-scale pelagic fisheries, including fish aggregating devices (FADs). Activities will include ship-based surveys to assess the potential of new and existing pelagic fisheries, studies on migration and movement of selected large pelagic species (including sharks), and research on optimization and development of FADs for large and small-scale pelagic fisheries.

**Outputs** include:

- A. Transboundary diagnostic identifying current status of important species, threats matrix, and regional/sub-regional management issues and needs; and
- B. Preparation and adoption of Strategic Action Plan for each fishery detailing how each relevant country will address issues identified in the component TDA.

#### Component 5: Monitoring of fishing effort and catch, existing value, and exploitation conflicts

This component will build capacity for regional management by developing and testing fisheries monitoring techniques. The component will support training of scientific observers at sea; monitoring of commercial landings and establishment of land-based monitoring and data verification systems; linkage of communication infrastructure; and development of coordination mechanisms and verification systems to establish a regional Vessel Monitoring System. It will also support an assessment of the financial value of exploited fisheries and use conflicts that might exist because of exploitation, development of an understanding of the social needs and structures of national stakeholder groups exploiting marine resources, and use of such information to guide management and maximize benefits from fisheries. **Outputs** include:

- A. A contribution to the overall Project output leading to agreements between countries sharing fishery resources that improve harmonized MCS actions; and
- B. Agreements between countries that each will recognize regional pressure and the need to consult as a precursor to setting exploitation limits on a fishery (particularly regarding licensing of foreign fishing fleet access to its 200 mile EEZ).

#### Component 6: Fisheries impact on non-consumptive resources

This component will undertake an assessment of the interaction between non-commercial marine resources (such as sea-birds, turtles and other species) and commercial fisheries. Studies will be funded out of a research grant fund and would generate a baseline assessment, GIS mapping of key species, assessments of marine biodiversity as alternative sources of income and identification of bio-indicator species and relationships between target species and ecosystem health. **Outputs** include:

- A. A Biodiversity map; and
- B. An Action plan (as part of TDA/SAP process) detailing issues and actions related to fishery exploitation impacts on non-target species.

#### Component 7: Strengthening regional and national fisheries management

This component will support the emerging regional fisheries management framework in the SWIO and build capacity in regional and national fisheries management bodies. The project will establish a working relationship and technical interface between SWIOFP and the SWIOFC, and establish a regional project management unit (PMU). The project will also assess national fisheries regulations and identify areas where harmonization is needed. **Outputs** include:

- A. Legal agreements and memoranda of understanding between two or more SWIOFP countries facilitating regionally harmonized resource management; and
- B. A stronger regional management structure for management of shared or straddling fisheries resources.

## **GEF – UNEP - ADDRESSING LAND-BASED ACTIVITIES IN THE WESTERN INDIAN OCEAN (WIO-LAB)**

**Broad Development Goal:** To contribute to the environmentally sustainable management and development of the West Indian Ocean region, by reducing land-based activities that harm rivers, estuaries, and coastal waters, as well as their biological resources.

### **Objectives and Components:**

#### **1: Reduce stress to the ecosystem by improving water and sediment quality**

- 1.A. Establish common methods for assessing water and sediment quality, including bioassays of coastal biota
- 1.B. Fill gaps in knowledge of priority pollutants (contaminant levels) in water and sediments, and major sources of pollutants (contaminant inputs)
- 1.C. Estimate the carrying capacity of the coastal waters, using an ecosystem-based approach
- 1.D. Determine coastal hot spots of pollution, building on the outcome of the African Process
- 1.E. Establish regional Environmental Quality Objectives and Environmental Quality Standards (EQO/EQS) for water and sediment quality
- 1.F. Develop compliance and long-term trend monitoring protocols and reporting (requires data base management and decision-support systems)
- 1.G. Implement demonstration projects for major land-based activities and pollutant sources, building on the African Process results which identified specific hot spots requiring intervention
- 1.H. Develop guidelines on best practices and procedures to address wastewater and implement demonstration projects
- 1.I. Implement action in specific locations to reduce and prevent the degradation of the coastal and marine environment caused by physical alteration and destruction of habitats, using the African Process results as a starting point

**Objective 2: Strengthen regional legal basis for preventing land-based sources of pollution, including through the implementation of the Global Programme of Action for the Protection of the Marine Environment from land-based Activities**

- 2.A. Review gaps in national legislation/ regulatory/ institutional frameworks
- 2.B. Review status of ratification of appropriate international conventions by countries, and assist countries in developing plans for ratifying those not yet ratified
- 2.C. Implement effective regional EIA processes
- 2.D. Assist countries in developing realistic and regionally integrated National Programmes of Action for land-based sources and activities
- 2.E. Develop and obtain approval for Protocol to the Nairobi Convention with Annexes, on Land Based Activities and Sources of Pollution
- 2.F. Promote and enhance the integrated management of river basin and coastal zone through application of the ICARM principles

**Objective 3: Develop regional capacity and strengthen institutions for sustainable, less polluting development, including the implementation of the Nairobi Convention and its action plan as approved by participating Governments**

- 3.A. Establish small GEF project unit within Nairobi Convention Secretariat in Nairobi for managing the GEF/UNEP/Norway project
- 3.B. Strengthen the EAF/RCU as the recognized and effective Regional Seas coordinating Unit for all regional policies and activities related to coastal and marine resources
- 3.C. Determine and satisfy training needs in region for LB activities and sources
- 3.D. Develop educational Programmes at all levels on LB activities and sources



- 3.E. Develop Regional/ Governmental/ Private Sector/ Public Sector partnerships on LB activities and sources
- 3.F. Identify, strengthen, and involve Stakeholders in LBS issues in the Region, including Monitoring and Evaluation, development of performance indicators
- 3.G. Implement small-grants Programme for broader stakeholder participation
- 3.H. Update TDA and SAP
- 3.I. Develop an East African regional node of the GPA Clearinghouse Mechanism

## ANNEX 6: PROGRAMMATIC LINKAGES (ASCLMEs PROJECT/ SWIOFP/ WIO-LaB)

The Table below maps the substantive Linkages among the Projects of the ASCLMEs Programme. ASCLMEs emphases appear in tandem with those of its major co-financing partner, the ACEP, as this gives a more inclusive picture of the full range of marine related activities that will be undertaken by the Programme.

**Key** The interests and responsibilities of the projects within the Programme are represented by:

+++.....A primary activity

++ ..... An important secondary activity

+ .....An activity of importance, but not main line

<b>Discipline: <u>Geoscientific Studies</u>. Mapping of the ocean floor to understand topography and structural habitat, identify trawl grounds, provide area species estimates, provide basal layers for GIS decision-making, and provide topographic information for oceanography and biology.</b>				
Activities	ASCLMEs Project / ACEP	SWIOFP	WIO-LaB	LME Module Linkage
Satellite Imagery	+++	++	+	Fish and Fisheries; Productivity
Bathymetry maps (coast drop-off, area species relationships, impact of fisheries)	+++	+	+	Fish and Fisheries; Productivity
Geology and Sedimentology	+++	+	+	Fish and Fisheries; Productivity; Pollution and Ecosystem Health
Geophysical Information	+++	+	+	Fish and Fisheries; Productivity
Use of Maps and GIS for public awareness and interactive education	+++	+	+	Socio-economic
<b>Discipline: <u>Oceanography</u>. The unifying force that drives and governs the ASCLMEs. Physical and chemical oceanography describes impacts of currents, water quality, temperature, and conductivity on ecological processes. Understanding of Oceanographic processes is fundamental to management of fisheries, conservation, and sustainability.</b>				
Activities	ASCLMEs Project/ACEP	SWIOFP	WIO-LaB	LME Module Linkage
Physical and Chemical	+++	+	+	Fish and Fisheries; Productivity; Pollution and Ecosystem Health
Biological	+++	+	+	Fish and Fisheries; Productivity; Pollution and Ecosystem Health
<b>Discipline: <u>Biology and Fisheries Science</u>. Overall ecosystem health can be more effectively measured and managed if there is an understanding of the relationships of animals and plants to one another and to the physical environment in which they live.</b>				
Activities	ASCLMEs Project/ACEP	SWIOFP	WIO-LaB	LME Module Linkage
Bio-indicators of System State	+++		++	Pollution and Ecosystem Health
Life Histories	+++	+++	+	Fish and Fisheries; Productivity; Pollution and Ecosystem Health
Biogeography and Habitat Definitions, Connectivity	+++	+++	+++	Fish and Fisheries; Productivity; Pollution and Ecosystem Health
Biodiversity Surveys (Taxonomy, Identification of “diversity hotspots”)	+++	+++	+++	Fish and Fisheries; Productivity; Pollution and Ecosystem Health
Biotelemetry (tagging)	+++	++	+	Fish and Fisheries; Productivity; Pollution and Ecosystem Health
Genetics	+++	+++	+	Fish and Fisheries; Productivity

Genome Studies	+++		+	Fish and Fisheries; Productivity
Fisheries (SWIOFP Activities)	++	+++		Fish and Fisheries; Productivity; Socio-Economics and Pollution and Ecosystem Health
FADs		+++	+	Fish and Fisheries; Productivity
<b>Discipline: Capacity Building (Education). Sustainability of the objectives of the Projects and Programme cannot be achieved absent a concerted effort to build permanent and regionally based capacity.</b>				
<b>Activities</b>	<b>ASCLMEs Project/ACEP</b>	<b>SWIOFP</b>	<b>WIO-LaB</b>	<b>LME Module Linkage</b>
PhD Training	+++	++	+	All LME Modules
MSc Training	+++	++	+	All LME Modules
Undergraduate Training	+++	++	+	All LME Modules
Primary and Secondary School Involvement				All LME Modules
<b>Discipline: Public Awareness and Environmental Education. Necessary to bridge the gap between science and the broader communities and community level stakeholders science must serve.</b>				
<b>Activities</b>	<b>ASCLMEs Project/ACEP</b>	<b>SWIOFP</b>	<b>WIO-LaB</b>	<b>LME Module Linkage</b>
Public Awareness	+++	+	++	Governance; Socio-Economics; Pollution and Ecosystem Health
Environmental Education	+++		++	Governance; Socio-Economics; Pollution and Ecosystem Health
Public Participation	+++	+	+++	Governance; Socio-Economics; Pollution and Ecosystem Health
<b>Discipline: Socio-Economics, Indigenous Knowledge, Communities. Poverty alleviation, food security, sustainability, conservation and general improvement of human lives are of paramount importance to coastal zone communities. A thorough understanding of the socio-economic context of coastal communities is imperative to management approaches.</b>				
<b>Activities</b>	<b>ASCLMEs Project/ACEP</b>	<b>SWIOFP</b>	<b>WIO-LaB</b>	<b>LME Module Linkage</b>
Socio-Economics	+++	+++	+++	Governance; Socio-Economics; Pollution and Ecosystem Health
Indigenous Knowledge Systems	+++	+	+	Governance; Socio-Economics; Pollution and Ecosystem Health
Communities	+++	+	+++	Governance; Socio-Economics; Pollution and Ecosystem Health
<b>Discipline: Data Management, Information and GIS Decision Making. All Programmes must build on previous work, obtain, synthesize and manage new data and ensure the availability of information and data to stakeholders in useable form.</b>				
<b>Activities</b>	<b>ASCLMEs Project/ ACEP</b>	<b>SWIOFP</b>	<b>WIO-LaB</b>	<b>LME Module Linkage</b>
Data and Information Acquisition and Management	+++	+++	+++	All LME Modules
Data Sharing	+++	+++	+++	All LME Modules
Regional GIS Development	+++	++	++	All LME Modules
<b>Discipline: Modelling: Interpretation of ecosystem processes, particularly those associated with physical, chemical and biological oceanography and their impacts on fisheries production and with fisheries management decisions can be dramatically advanced through modelling.</b>				
<b>Activities</b>	<b>ASCLMEs Project/ACEP</b>	<b>SWIOFP</b>	<b>WIO-LaB</b>	<b>LME Module Linkage</b>
Ecosystem	+++	+	+	Fish and Fisheries; Productivity; Pollution and Ecosystem Health
Fisheries	+	+++	+	Fish and Fisheries; Productivity; Pollution and Ecosystem Health

Bioeconomics	+	+++	+	Fish and Fisheries; Productivity; Pollution and Ecosystem Health
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N.B. SWIOFP will be addressing open ocean (beyond the 150 m depth contour) industrial sector fisheries whereas the ASCLMEs Project will be capturing information on artisanal and subsistence fisheries at the coastal level

## ANNEX 7: IDENTIFIED PRIORITY AREAS FOR ASSESSMENT AND MAIN DATA GAPS

### A. SUMMARY OF DATA GAPS, ASSESSMENT METHODOLOGIES AND MANAGEMENT APPLICATIONS

This summary is a synopsis of the information provided in detail below – **B. Detailed Priority Areas for Assessment.** Table 7 & 8 in the main text break this information into more logical presentation of the gaps and then the management applications.

<b>Geographic Area: Somali Upwelling and Penetration of Red Sea water in the ASCLMEs</b>		
<u>Data Gaps:</u> Information on environmental variability, upwelling, productivity and related fisheries . Assessments need to determine how Red Sea water reaches the ASCLMEs to increase understanding of global thermohaline circulation as well as inter-ocean exchanges of water masses.	<u>Assessment Methodology:</u> Cruise of the Nansen to the Somali Upwelling in conjunction with the SWIOFP project. Information collected on phytoplankton growth rates, population and size distribution of zooplankton, available light for photosynthesis, conductivity, temperature, salinity, chlorophyll concentrations, dissolved oxygen, pH, sea surface height and current velocity measurements. Measurements to also include sea floor mapping, bathymetry, wind speed and direction, solar radiation, sediment and benthos sampling, and acoustics. Two cruises foreseen. Remote sensing and GIS systems will also be utilized.	<u>Management Application:</u> Improved understanding of determinants of productivity in the Somali Current LME needed to manage pelagic fishing activities in the area.
<b>Geographic Area: Kenya and Tanzania Coasts</b>		
<u>Data Gaps:</u> Mapping needed of inshore circulation patterns. Management is impeded by information gaps on the movement of fish larvae, recruitment, environmental conditions for fisheries, and the dispersal of pollutants.	<u>Assessment Methodology:</u> Cruises of the Nansen and smaller vessels contracted in partnership with SWIOFP and WIO-LaB. Information gathered would include phytoplankton growth rates, population and size distribution of zooplankton, available light for photosynthesis, conductivity, temperature, salinity, chlorophyll concentrations, dissolved oxygen, pH, and sea surface height and current velocity measurements. Measurements to also include sea floor mapping, bathymetry, logging of wind speed and direction, solar radiation, sediment and benthos sampling, and acoustics. Remote sensing and GIS systems will also be utilized.	<u>Management Application:</u> Improved knowledge of transboundary environmental processes allows the countries to plan and adapt management schemes governing artisanal fisheries and pollution reduction in the area.
<b>Geographic Area: Mascarene Plateau</b>		
<u>Data Gaps:</u> The interaction of physical, chemical and biological processes in this large, shallow, mid-ocean region needs to be better understood to inform management practices. Specific information needed on seagrass beds, overall climatic patterns and variability, and the potential influence of the Indian Equatorial Jet on productivity in the ASCLMEs.	<u>Assessment Methodology:</u> Two cruises by the Nansen in conjunction with the SWIOFP project. Information collected on phytoplankton growth rates, population and size distribution of zooplankton, available light for photosynthesis, conductivity, temperature, salinity, chlorophyll concentrations, dissolved oxygen, pH, and sea surface height and current velocity measurements. Measurements to include sea floor mapping, bathymetry, logging of wind speeds and solar radiation, sediment and benthos sampling, and acoustics. Remote sensing and GIS systems will be also utilized.	<u>Management Application:</u> Information needed to define whether the Mascarene Plateau should be managed as a discrete LME.
<b>Geographic Area: System Wide</b>		
<u>Data Gaps:</u> Improved understanding of the role of the	<u>Assessment Approach:</u> The project will partner with the ongoing work of the CLIVAR-Goals	<u>Management Application:</u>

<p>AA-Monsoon on the predictability of the global climate system.</p>	<p>project of the WMO/IOC/ICSU World Climate Research Programme.</p>	<p>Improved understanding of Ocean-atmosphere links in the ASCLMEs contributes to understanding of global climate processes. The information also has utility for inland river basin management activities in SSA (Lake Tanganyika, Orange River etc).</p>
<p><b>Geographic Area: Southwest Indian Ocean shelf regions</b></p>		
<p><u>Data Gaps:</u> Knowledge of shelf circulation patterns to better understand movement of organisms such as fish larvae, dispersal of pollutants. Information on system productivity needed.</p>	<p><u>Assessment Methodology:</u> Two cruises of the Nansen will be undertaken and work will be jointly undertaken with SWIOFP. Information collected on phytoplankton growth rates, population and size distribution of zooplankton, available light for photosynthesis, conductivity, temperature, salinity, chlorophyll concentrations, dissolved oxygen, pH, and sea surface height and current velocity measurements. Measurements to include sea floor mapping, bathymetry, logging of wind speed and solar radiation, sediment and benthos sampling, and acoustics.</p>	<p><u>Management Application:</u> Information on productivity and larval transport for fish and invertebrates is needed to institute an ecosystem-based approach to fisheries management.</p>
<p><b>Geographic Area: South Equatorial Current</b></p>		
<p><u>Data Gaps:</u> Information on the circulation patterns of off shore currents is incomplete. Productivity and chemical oceanographic assessments also need to be undertaken.</p>	<p><u>Assessment Methodology:</u> Two cruises by the Nansen in conjunction with the SWIOFP project. Information collected on phytoplankton growth rates, population and size distribution of zooplankton, available light for photosynthesis, conductivity, temperature, salinity, chlorophyll concentrations, dissolved oxygen, pH, and sea surface height and current velocity measurements. Measurements to include sea floor mapping, bathymetry, logging of wind speed and solar radiation, sediment and benthos sampling, and acoustics. Remote sensing and GIS systems will be utilized in addition to cruises.</p>	<p><u>Management Application:</u> Offshore currents need to be better understood as they have bearing on coastal pollution, coral bleaching and productivity. Information has application for adaptation schemes, pollution control and fisheries.</p>
<p><b>Geographic Area: Region-Wide (Using indicator species in the Mozambique Channel and Seychelles)</b></p>		
<p><u>Data Gaps:</u> No baseline information on loadings in key Indicator species of PTS and POPs.</p>	<p><u>Assessment Methodology:</u> Analyzes of heavy metal concentrations of mercury, selenium, cadmium, copper, zinc, and analyzes of POPs that are listed under the Stockholm Convention and heavy metal concentrations of mercury, selenium, cadmium, copper, zinc, and arsenic in the muscle, liver, and kidney tissue of seabirds and fish, and in the blood and feathers of seabirds.</p>	<p><u>Management Application:</u> Future decisions on regulatory measures to be taken re. heavy metal releases and POPs will require establishment of a baseline, which the project will provide through analyzes of heavy metal and POPs concentrations in key indicator species.</p>
<p><b>Geographic Area: The splitting of the southern and northern branch of the East Madagascar Current</b></p>		
<p><u>Data Gaps:</u> No current information on this area is available. Knowledge of shelf and coastal circulations,</p>	<p><u>Assessment Methodology:</u> One cruise by the Nansen in conjunction with the SWIOFP project. Information collected on phytoplankton growth rate, population and size distribution of</p>	<p><u>Management Application:</u> Proper environmental management will</p>

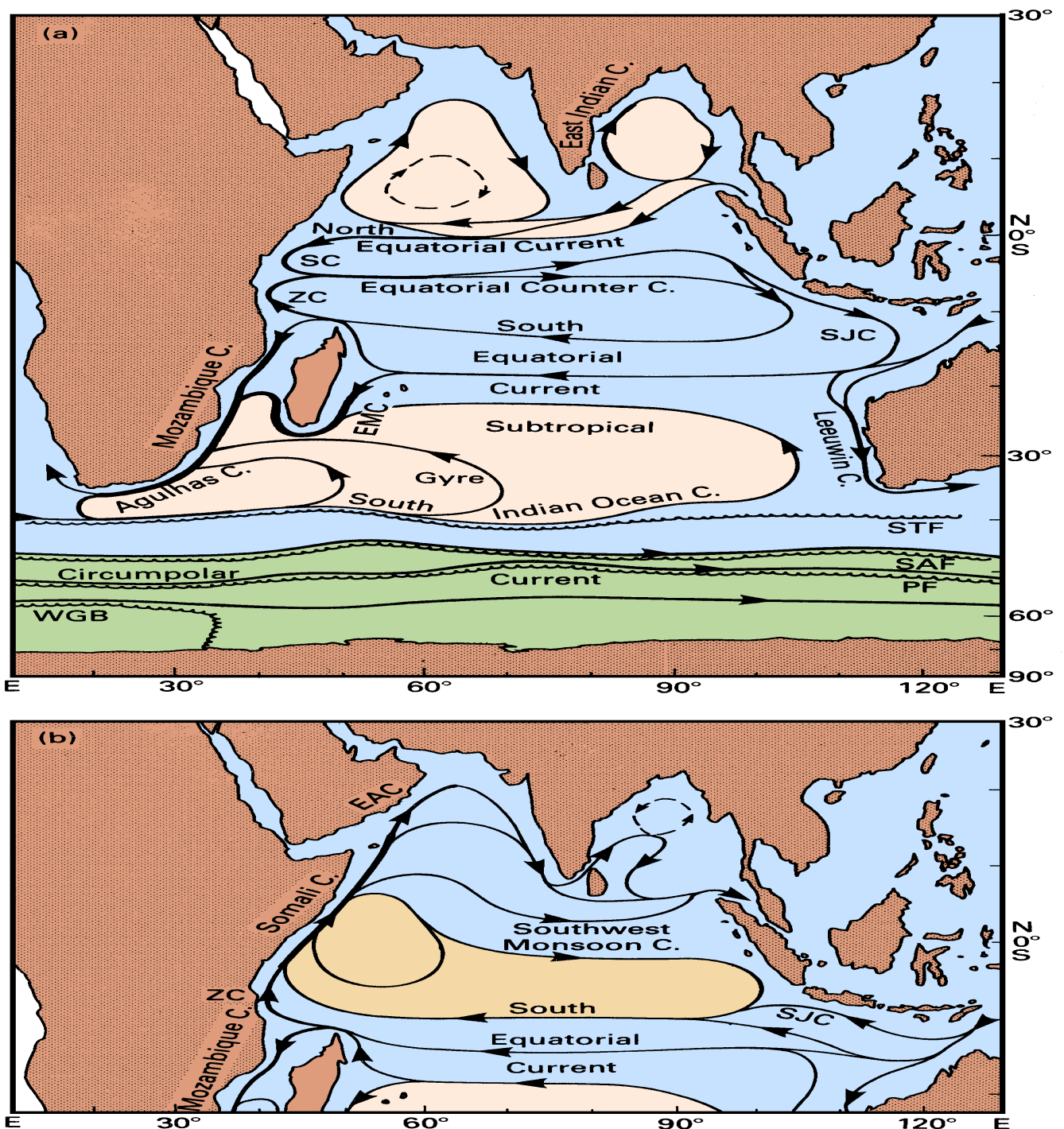
<p>biodiversity, chemistry and geology virtually non-existent.</p>	<p>zooplankton, available light for photosynthesis, conductivity, temperature, salinity, chlorophyll concentrations, dissolved oxygen, pH, and sea surface height and current velocity measurements. Measurements to include sea floor mapping, bathymetry, logging of wind speed and solar radiation, sediment and benthos sampling, and acoustics.</p>	<p>require knowledge of shelf and coastal circulations as well as biodiversity (which is largely non-existent). Shelf water and organisms of this shelf area are known to be moved by vortex dipoles from the southern branch of this current into the Mozambique Channel and to the Agulhas Current; there is seeding potential for organisms of the latter regions and thus there are cross-boundary aspects thus making need for regional management highly likely.</p>
<p><b>Geographic Area: The forcing of the South Madagascar upwelling cell</b></p>		
<p><u>Data Gaps:</u> Habitat classifications, resource identification and taxonomic work, and work related generally to establish baseline information on coastal circulations, biodiversity, chemistry and geology.</p>	<p><u>Assessment Methodology:</u> One cruise by the Nansen in conjunction with the SWIOFP project. Information collected on phytoplankton growth rate, population and size distribution of zooplankton, available light for photosynthesis, conductivity, temperature, salinity, chlorophyll concentrations, dissolved oxygen, pH, and sea surface height and current velocity measurements. Measurements to include sea floor mapping, bathymetry, logging of wind speed and solar radiation, sediment and benthos sampling, and acoustics. Remote sensing and GIS systems will be utilized in addition to cruises. Current mooring array to be utilized. Remote sensing and GIS systems will also be utilized.</p>	<p><u>Management Application:</u> Management application at national and regional level as there are indications that the organisms and larvae from this region may supply recruits for parts of the Mozambique Channel and for the shelves adjacent to the Agulhas Current proper, thus making this region of cross-boundary importance for the management of living resources.</p>
<p><b>Geographic Area: Mozambique Channel</b></p>		
<p><u>Data Gaps:</u> Information needed on the shedding and triggering of Mozambique eddies. Information also needed on system primary/ Secondary productivity.</p>	<p><u>Assessment Methodology:</u> Cruises will be undertaken jointly by the ASCLMEs Project, SWIOFP, and the ACEP. The Nansen and Algoa will be deployed and will undertake fisheries surveys through trawls. Information collected on phytoplankton growth rate, population and size distribution of zooplankton, available light for photosynthesis, conductivity, temperature, salinity, chlorophyll concentrations, dissolved oxygen, pH, and sea surface height and current velocity measurements. Measurements to include sea floor mapping, bathymetry, logging of wind speed and solar radiation, sediment and benthos sampling, and acoustics. A current meter array is also to be maintained and sondes deployed.</p>	<p><u>Management Application:</u> Management application at regional and global scale. These eddies carry heat and momentum that are a component of the global thermohaline circulation. An increase or decrease in the shedding frequency of these eddies therefore may have global implications. Furthermore, these</p>

		<p>eddies have been implicated in triggering Natal Pulses and thus in the inter-ocean exchanges of water between the Indian and Atlantic Oceans. The work is therefore of substantial importance to regional and global CC management.</p>
<p><b>Geographic Area: Areas of the Mozambique and SA coasts, including principally the Delagoa eddy, the point at which the Agulhas Current begins to influence shelf circulation off Mozambique and SA, the Natal Pulse, the driving of the St. Lucia and Port Alfred upwelling cells.</b></p>		
<p><u>Data Gaps:</u> Information needed on eddies to determine effects on overall ecology of the areas and particularly on downstream biodiversity, influence on shelf circulation, disposition of river outflows, dispersal of pollutants and thus habitat of organisms, and potential role on health of prawn fisheries;</p>	<p><u>Assessment Methodology:</u> Cruises will be undertaken jointly by the ASCLMEs Project, SWIOFP, and the ACEP. The Nansen and Algoa will be deployed and will undertake fisheries surveys through trawls. Information collected on phytoplankton growth rate, population and size distribution of zooplankton, available light for photosynthesis, conductivity, temperature, salinity, chlorophyll concentrations, dissolved oxygen, pH, and sea surface height and current velocity measurements. Measurements to include sea floor mapping, bathymetry, logging of wind speed and solar radiation, sediment and benthos sampling, and acoustics. Remote sensing and GIS systems will be utilized in addition to cruises.</p>	<p><u>Management Application:</u> Information needed to map pollution transport, to establish priorities for pollution control. Information on larval transport and productivity is necessary to protect recruitment areas for fisheries.</p>
<p><b>Geographic Area: Agulhas Bank</b></p>		
<p><u>Data Gaps:</u> A proper understanding of the hydrodynamic workings of the Agulhas Bank is needed to enhance existing information on the valuable anchovy and sardine fishery spawning ground, which has implications for the health of these important fisheries in the Benguela Current LME.</p>	<p><u>Assessment Methodology:</u> Placement of current meter moorings at the upwelling and one cruise of the Algoa.</p>	<p><u>Management Application:</u> Management of transboundary resources of the BCLME.</p>



**B. DETAILED DISCUSSION OF PRIORITY AREAS FOR ASSESSMENT & DATA GAPS**

Technically, LMEs are defined using criteria such as bathymetry, hydrography, productivity and trophodynamics. The Somali LME (figure 2) extends geographically south-to-north from the Comoros Islands and the northern tip of Madagascar to the horn of Africa. The ocean circulation system here is largely dominated by the Indian Monsoon regime and exhibits a unique reversal of ocean currents with season. The Agulhas LME (see Figure 1) includes the Agulhas Current proper along the east coast of South Africa, as well as its source regions in the Mozambique Channel and east of Madagascar. This is a typical western boundary current system, the largest of its kind in the world. The island States included in this proposal (Mauritius, Comoros, Seychelles and Madagascar) are all influenced by the South Equatorial Current that carries water from the east Indian Ocean to the west. For illustrative purposes maps depicting the ASCLMEs are included below



The environmental assessments that will be commissioned under the project are aimed at improving understanding of the physical, chemical and biological characteristics of the ASCLMEs. The information is needed to finalize the Transboundary Diagnostic Analysis and Strategic Action Programme for these LMEs, enabling the participating countries to institute adaptive management regimes for these systems. This annex summarizes the target areas for the assessments, both in terms of geographic focus and thematic coverage. The targets have been arrived at following an iterative process of prioritization and stakeholder validation. Three workshops have been convened to inform this process, namely: 1) workshop held in Maputo, Mozambique (September 2002), 2) a Science Planning Workshop in Dal Josafat, South Africa (May 2004); and 3) a Regional Information Workshop in Grahamstown, South Africa (October 2004). The targets were further informed based on an exhaustive review of available information on the LMEs (Roman and Lutjeharms, 2004). The priorities were informed 1) based on management needs, including the reduction of coastal pollution, management of fish stocks, restoration of damaged habitats and achievement of economic benefits; and 2) based on the extent to which they add to understanding of transboundary threats and effects that need to be mitigated at the regional level, and ecosystem functioning (at the scale of the LMEs)<sup>46</sup>.

### **Generic Assessment Areas**

A key issue that needs to be addressed, in instituting an ecosystem approach to LME management is: what aspects of the marine ecosystem of the ASCLMEs and thus the cross-border fisheries are most easily disturbed by human interference and climate variability? This is a cross cutting concern, the answers to which require a solid understanding of the oceanographic conditions of the region, and their relationships to ecosystem dynamics, and ultimately, to the health of the region's fisheries. A number of generic questions will need to be addressed in order to establish these understandings:

- a) What are the inshore circulation patterns in the ASCLMEs and how do these affect local habitats?
- b) Does the circulation of Eastern Africa, Madagascar and the islands of the Indian Ocean play a critical role in global thermohaline circulation and thus in climate variability and global climate change?
- c) What components of the offshore circulation affect the circulation of shelf regions in the ASCLMEs and thus the distribution of marine organisms?
- d) What are the water characteristics, water quality indexes and water circulation patterns on the shelf regions of the ASCLMEs that have the most marked effects on trans-boundary ecosystems, and thus living marine resources?
- e) What are the most important components of terrestrial run-off that influence coastal ecosystems and their health?

A number of specific issues have been identified within each of the above generic assessment areas.

### **Specific Priority Assessment Areas**

**A. WHAT ARE THE INSHORE CIRCULATION PATTERNS IN THE ASCLMES AND HOW DO THESE AFFECT LOCAL HABITATS?**

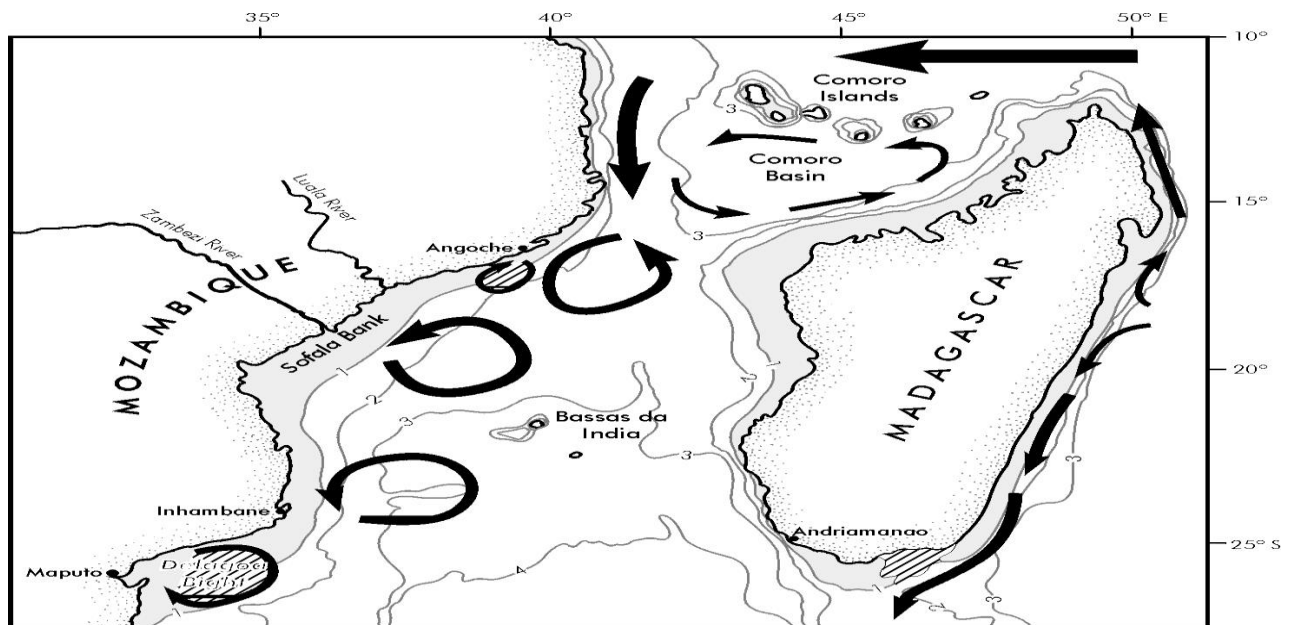
**1. What is the inshore circulation pattern along the coasts of Kenya and Tanzania and how does this affect the ecosystems?** The offshore currents along the coasts of Kenya and Tanzania have been extensively studied as part of previous international oceanographic investigations. The fisheries of both these countries are largely artisanal and include prawn fisheries. Information gaps on environmental conditions and their variability in space and time are most significant in inshore regions. The inshore circulation may play a defining role in many of the processes that affect artisanal fisheries, including the movement of fish and fish larvae, recruitment, and environmental conditions.

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<sup>46</sup> The following criteria were established in defining the assessment priorities. First, they must be scientifically defensible. Second, they must fill the most critical knowledge gaps that currently preclude management of trans-boundary LMEs and their constituent living resources. Third, they must provide socio-economic benefits for all the countries of the region (i.e. contribute to efforts to maintain food security, or plan response measures to natural disasters). Fourth, they must add value to existing information. Fifth, they must be cost effective and achievable.

2. **What components of the inshore circulation affect the circulation on shelf regions in the SWIO and thus the distribution of marine organisms and the geographic structure of marine ecosystems?** The inshore circulation, i.e. at the shelf edge, has a decisive influence on most shelves of the South West Indian Ocean (Lutjeharms, 2004), particularly where the shelf is narrow (see Figures 1 and 3). An understanding of shelf circulation in turn is crucial for an understanding of the movement of organisms, such as fish larvae, and the dispersal of pollutants. Such circulation occurs across boundaries and carries marine organisms with it. Lack of knowledge as well as data on the effect of onshore currents on shelf circulation is one of the major gaps that need to be filled if the trans-boundary living resources are to be managed effectively. Studies of these processes will help build local scientific and management capacity and create skills in areas most useful to LME management.

3. **What are the shelf and coastal circulation patterns along the East Madagascar shoreline?** The narrow shelf east of Madagascar (see Figure 3) is one of the least studied shelf regions in the world's oceans. Only one partial investigation of fish resources has been undertaken on part of the shelf, and that was 20 years ago. The knowledge of shelf and coastal circulations as well as biodiversity is largely non-existent, making proper environmental management impossible. A baseline study of hydrodynamics and biodiversity is clearly urgently called for. This coastline is in many respects ideal for tourism and this is being considered for the future. A thorough investigation will establish a reference level against which possible future pollution and environmental degradation can be measured. A first, proper hydrographic survey of this current and its variability will give a very solid understanding on the effect of the ocean environment on this coastal region. This may at first glance seem a problem of national importance, but based on limited current knowledge, this seems not to be the case. Shelf water and organisms of this shelf area are known to be moved by vortex dipoles from the southern branch of this current into the Mozambique Channel and to the Agulhas Current; there is seeding potential for organisms of the latter regions and thus there are cross-boundary aspects.



**Figure 3.** The general circulation in the vicinity of Madagascar and the Mozambique Channel. Shaded areas denote the continental shelves shallower than 1000 m. Lined regions indicate upwelling cells. The bathymetry is given in km.

B. DOES THE CIRCULATION OF EASTERN AFRICA, MADAGASCAR AND THE ISLANDS OF THE INDIAN OCEAN PLAY A CRITICAL ROLE IN GLOBAL THERMOHALINE CIRCULATION AND THUS IN CLIMATE VARIABILITY AND GLOBAL CLIMATE CHANGE?

4. **What are the implications of the Somali Current upwelling on issues related to environmental variability?** It is well established that the Western Indian Ocean is the site of some of

the most dynamically varying LMEs that exist on the planet<sup>47</sup>. The Somali Current develops during the southwest monsoon to become the fastest open-ocean current in the world<sup>48</sup>, and the coastal upwelling that occurs along the African coast during the intensified phase of the Somali Current constitutes the most intense large-scale seasonal coastal upwelling system in the world. The Findlater Jet (that extends from the Somali coast out over the Arabian Sea) is the strongest low-level atmospheric jet that exists as a regular feature anywhere in the world<sup>49</sup>. In addition, the northwestern Indian Ocean has been identified as a major zone of methane emissions (methane being a particularly potent greenhouse gas, some 21 times as effective as carbon dioxide, per unit weight, in driving global warming)<sup>50</sup>. However the dynamics underpinning these processes and environmental variability remain poorly understood.

**5. What are the more precise linkages between the Asian-Australian monsoon and the global climate system?** The Asian-Australian (AA) monsoon, which is a highly significant factor within the Somali and Agulhas LMEs, is a key component of the earth's climate system and affects the livelihood of more than 60% of humanity. Better predictions of the monsoon will greatly benefit the social and economic well-being of this large segment of the world's population<sup>51</sup>. In addition, there is strong linkage of the AA monsoon system to the global climate system, and thus improved understanding and prediction of the AA monsoon is not only crucial to the WIO but also globally. Past studies have shown that the AA-monsoon is linked to interannual variability of the tropical ocean-atmosphere system, such as the El Niño Southern Oscillation (ENSO) and the tropical biennial oscillation, and other studies suggest that the AA-monsoon may strongly impact the climate outside the monsoon region, including extratropical North America<sup>52</sup>. Indeed, a primary goal of the CLIVAR-GOALS project of the WMO/IOC/ICSU World Climate Research Programme is to better understand "... the role of the AA-monsoon on the predictability of the global climate system, in particular parts related to ENSO." The project will accordingly develop a close working relationship with CLIVAR.

**6. What are the precise effects of the unique biological and physical characteristics of the Mascarene Plateau on the surrounding parts of the Agulhas and Somali LMEs?** The Mascarene Plateau arches across the Western Indian Ocean from the Seychelles down to Mauritius, with water depths up to 100 m. The area supports a wide diversity of ecosystems with potential for exploitable resources. The Plateau extends as a fault-composite arc for 2,300 km from the Equator southwards, with water depths ranging from 0 to 100 m<sup>53</sup>. It is a strong topographic feature, and probably acts as a barrier to latitudinal water flows in the Western Indian Ocean, and thus is of distinct, regional importance. Management of marine resources over large ocean areas provides a great challenge. Despite extensive studies in many of these large ocean areas, the interaction of physical and biological processes in large shallow mid-oceanic areas, such as the Mascarene Plateau is not well understood.

- The climate regime of the Indian Ocean (monsoons and trade winds) is influenced by its geography and its proximity to two large continental masses. However, the impact of the Mascarene Plateau on these phenomena remain poorly understood and understanding of the climate regime is undermined by the lack of a specific climatic description for the area<sup>54</sup>.
- An intense Indian Equatorial Jet (EJ) signals the transition from the northeast to southwest monsoons. The behavior of this jet is, however, still not well known. Research shows that in any particular year the jet appears within the three-month window April–June as a feature of shorter (one-month) durations with higher peak velocities. Although it is on average a weak feature it

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<sup>47</sup> Bakun, A., S. Lluch-Cota and C. Roy. 1998. Coastal upwelling and other processes regulating ecosystem productivity and fish production in the western Indian Ocean. p. 103-141. In: K. Sherman, E. Okemwa and M. Ntiba, (eds.) Large Marine Ecosystems of the Indian Ocean: Assessment, Sustainability, and Management. Blackwell Science Inc. Malden, MA. USA.

<sup>48</sup> Ibid

<sup>49</sup> Ibid

<sup>50</sup> Bakun, A. and S.J. Weeks. 2004. Greenhouse gas buildup, sardines, submarine eruptions, and the possibility of abrupt degradation of intense marine upwelling ecosystems. *Ecology Letters* 7: 1015-1023.

<sup>51</sup> CLIVAR Project website: <http://www.clivar.org/index.htm>

<sup>52</sup> Ibid

<sup>53</sup> It is also described as a distinct shelf of continental origin (Mart, 1988).

<sup>54</sup> A few studies were undertaken in the 1990s by the INDOEX research project (Ramanathan *et al.*, 1995)

may nonetheless result in a distinct physical forcing. As this could have an influence on productivity (and thus fisheries), improved understanding of this phenomenon is seen as important.

7. Does the circulation off western Africa, Madagascar and islands of the South West Indian Ocean play a critical role in global thermohaline circulation and thus in climate variability and global climate change? Considerable effort has been expended over the past decade in studying the manner in which the greater Agulhas Current contributes to the global thermohaline circulation. It has been demonstrated, through many international studies that it plays a crucial role in inter-ocean exchanges of water and that variations to these fluxes contribute to changes in climate variability. These results naturally have an enormous, but indirect, socio-economic impact. A number of key problems that require further investigation have been identified. Many of these do not require any observations at sea but can be researched through modelling, remote sensing and theoretical studies:

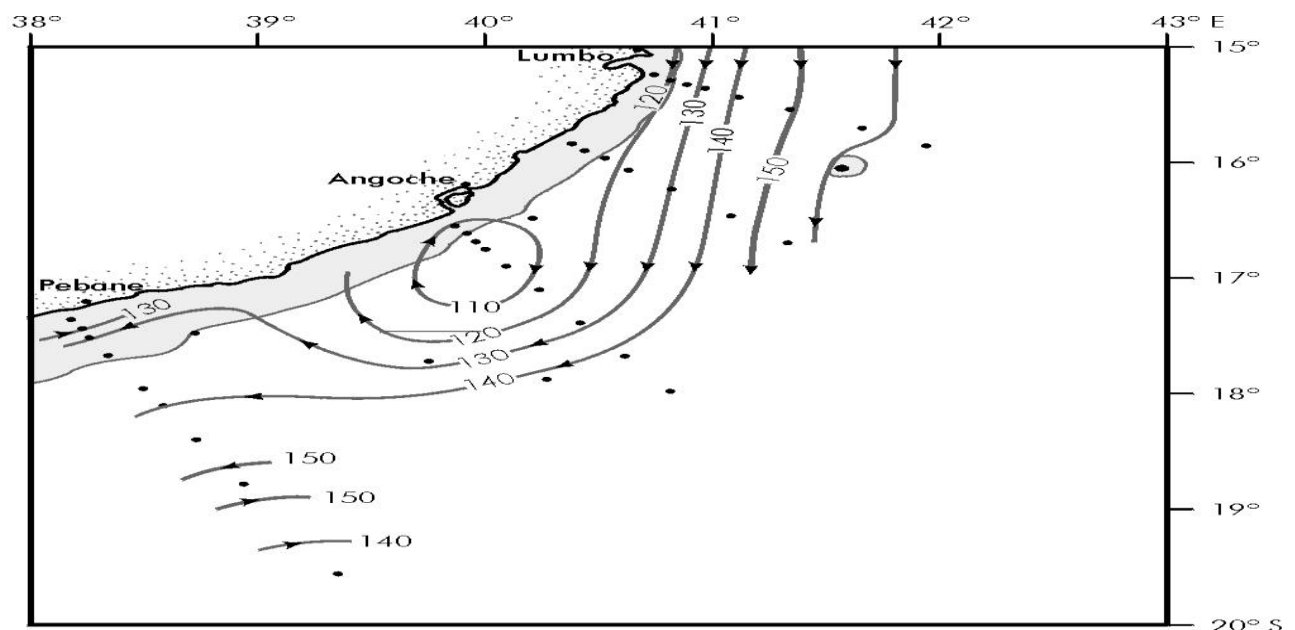
- What is the frequency of shedding of Mozambique eddies? It has recently been demonstrated that the main currents of the Mozambique Channel consist of anti-cyclonic eddies formed at the narrows of the Mozambique Channel from where they move in a polar direction. These eddies carry heat and momentum that are a component of the global thermohaline circulation. An increase or decrease in the shedding frequency of these eddies therefore may have global implications. Furthermore, these eddies have been implicated in triggering Natal Pulses and thus in the inter-ocean exchanges of water between the Indian and Atlantic Oceans. With regard to their impact on climate change, they are therefore of substantial importance. A sophisticated array of current meter moorings placed in the Mozambique Channel narrows by a research team from the Netherlands are currently monitoring the shedding of eddies. This work could be supported by the placement of hydrographic stations through eddies on research cruises as well as by altimetry.
- The triggering of Mozambique eddies Mozambique eddies move past the shelves of the coast of Mozambique where it has been observed that they draw water from the shelves into the deep sea. It is probable that they also affect the circulation of water on the shelves. In addition, they carry Indo-Pacific organisms from the tropics across political boundaries. It is not known what effect the Mozambique eddies have on the shelves of Madagascar, since there are no adequate hydrographic data for that region. It is therefore important to establish what factors or driving forces trigger the shedding of a Mozambique eddy. This could probably be most effectively done by analysis of remote sensing products and by the judicious use of modelling. Hydrographic observations in eddies will be of enormous value in establishing their nature and dynamics.
- Penetration of Red Sea Water in the South West Indian Ocean: The general, averaged motion of Red Sea Water into the ASCLMEs region has been established. However, it is not clear how Red Sea Water reaches various parts of this ocean region: does it come in a seasonal manner, in irregular occurring filaments or is it a continuous process? Understanding this cross-boundary process is important from a climatology point of view since this process has an impact on the global thermohaline circulation as well as on inter-ocean exchanges of water masses. The analysis for this project will have to be based on existing hydrographic data, but new additions of data in places in the ASCLMEs where no data are currently available will be of immense value. These data could be collected during cruises in designated regions where knowledge gaps need to be filled.
- Movement of South Equatorial Current eddies and their impact: It has been shown unequivocally that eddies embedded in the South Equatorial Current, on reaching the east and south coast of Madagascar as well as the region of the Comoros and the Mozambican coast, have a decided impact on the local circulations. Furthermore, it has been suggested that they play a triggering role in what may be considered the greater Agulhas Current system. This triggering role may have substantial climatological effects and thus influence global climate change. Comprehensive international studies are underway to study these effects, but they are limited to modelling and analyzes of satellite remote sensing. Hydrographic observations at sea in any of the ASCLMEs regions where these eddies are to be found would be of value in establishing their hydrographic and dynamic natures and thus their role in affecting climate patterns and variability.

**WHAT COMPONENTS OF THE OFFSHORE CIRCULATION AFFECT THE CIRCULATION OF SHELF REGIONS IN THE ASCLMEs AND THUS THE DISTRIBUTION OF MARINE ORGANISMS?**

**8. What is the influence of the South Equatorial Current on the shelf circulations of the WIO islands?** The Seychelles, Mauritius, Reunion and other islands have in many respects similar oceanic environments. They are open to deep-sea circulatory effects due to a very narrow shelf and are all influenced by the South Equatorial Current coming from the east (see Figure 1). This Current may be affected by lateral Rossby waves and by perturbations in the form of eddies. The effect of these on the marine environments of the islands is very poorly understood. This needs to be rectified. In most cases the economies of these islands depend increasingly on nature-based tourism. Coastal pollution, and climate change induced habitat destruction (such as bleaching of coral reefs) are aspects influenced by offshore currents and their variability. All in turn have direct economic implications.

**9. What are the determinants of forcing of the South Madagascar upwelling cell?** A number of previous investigations have pointed to the existence of an upwelling cell off the southeast coast of Madagascar. This shelf upwelling cell does not seem to be wind-driven, but rather driven by the passing southern branch of the East Madagascar Current. To date, only one research cruise vessel has tangentially investigated the feature. This upwelling cell may have substantial socio-economic implications. There is some anecdotal evidence that fishing in the region is enhanced, but this has not been investigated rigorously. There are also indications that the organisms and larvae from this region may supply recruits for parts of the Mozambique Channel and for the shelves adjacent to the Agulhas Current proper, thus making this region of cross-boundary importance for the management of living resources. Habitat classifications, resource identification and taxonomic work need to be carried out. The driving forces of the cell and their variability need to be understood in order to manage potential fisheries.

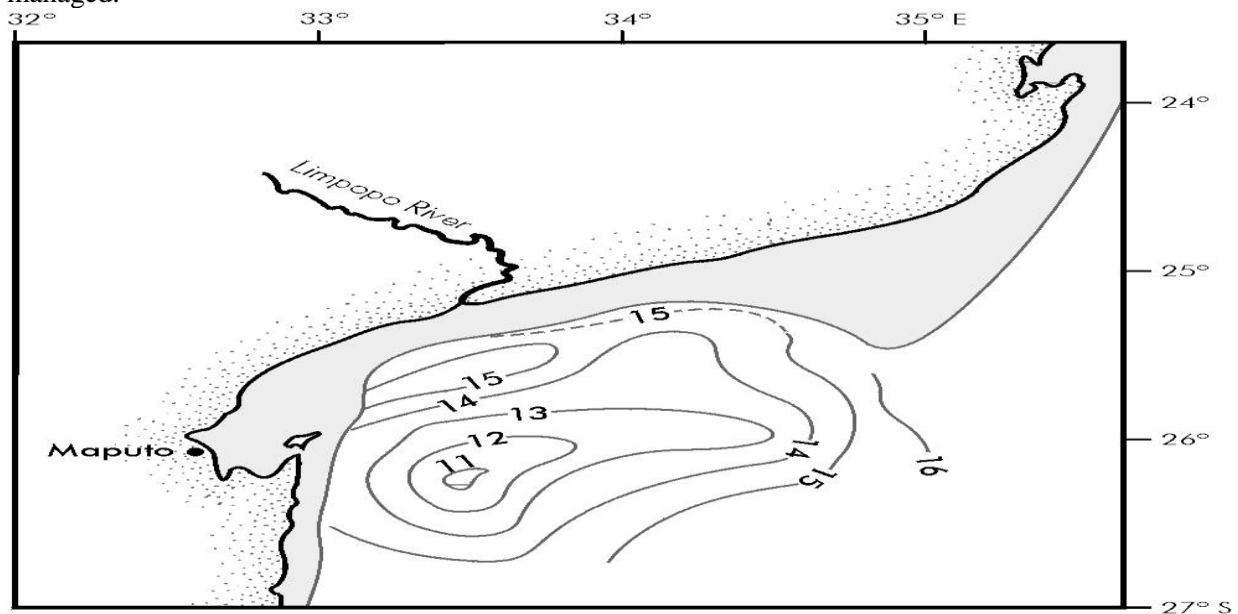
**10. How is the Angoche upwelling cell shaped?** Information on primary productivity and its relation to fisheries is generally limited for the whole ASCLMEs region. Nevertheless, a number of prime locations for urgent investigation stand out. One is the coastal upwelling cell off southern Madagascar (see preceding bullet). Very little is known on the primary productivity here. On the western side of the Mozambique Channel there is slightly more information and it has been demonstrated that the highest primary productivity, by far, is to be found in an upwelling cell off Angoche (see Figures 3 and 4). The relationship of this feature to local fisheries and fisheries further downstream is imperfectly understood. The role of this cell in generating recruits for fisheries downstream makes this an important cross-boundary issue. The sustainability of this upwelling cell, its variability, its contribution to biodiversity and its driving forces are currently not well understood.



**Figure 4.** The flow pattern around the Angoche upwelling cell along the coast of Mozambique (see Figure 2 for general location) according to a cruise undertaken in 1980. After Lutjeharms (2004). Black dots denote the location of hydrographic stations. The most intense upwelling and highest values of chlorophyll-

a on this occasion occurred within the 110 isoline. These isolines give the dynamic topography of the sea surface relative to 600 dbar in dynamic centimetre.

11. **What is the influence of Mozambique eddies on the adjacent shelf waters?** While past investigations have shown that a Mozambique current does not exist as such, large, anti-cyclonic ocean eddies are formed in the narrows of the Mozambique Channel and these eddies move along the western shelf creating the illusion of a western boundary current (see Figures 1 and 3). Confirmation of this scenario is very recent. This has crucial importance for an understanding of the circulation on the shelves off the Mozambican coast, their ecology, their role in sustaining local and downstream biodiversity and their consequent role in sustaining local and downstream fisheries. It has been demonstrated that passing Mozambique eddies draw off water and phytoplankton from the shelves in this region. This is only one aspect that requires investigation in order to secure a better understanding of underlying ocean variability—in turn needed to ensure living marine resources are effectively managed.

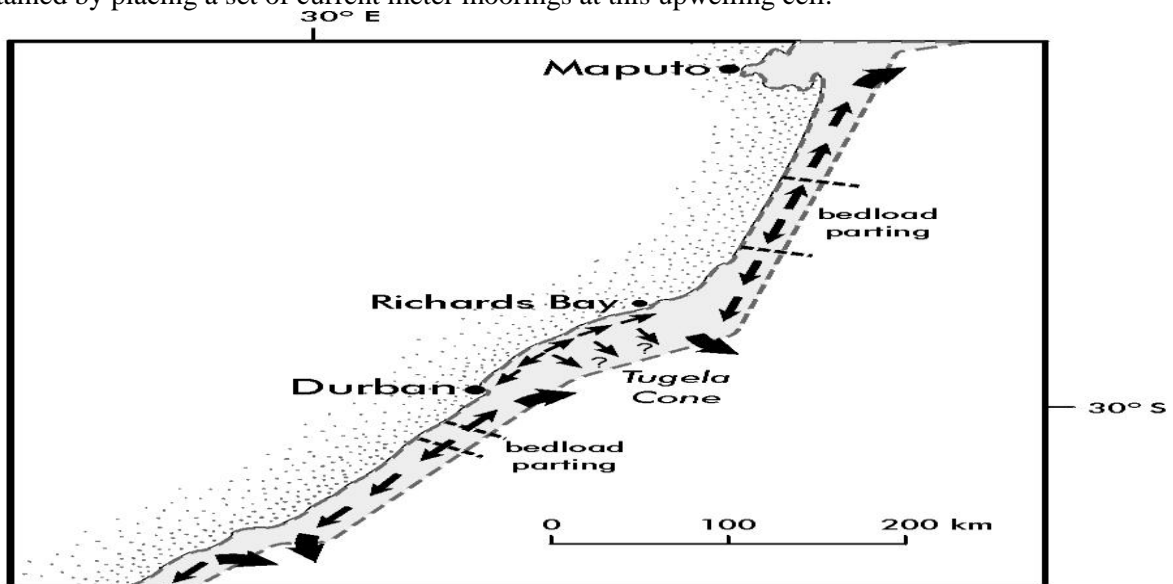


**Figure 5.** The eddy in the Delagoa Bight of the Mozambican coast (see Figure 3 for general location in the Mozambique Channel). The shaded area is the continental shelf shallower than 1000 m. Isolines are the isotherms at a depth of 200m showing the upwelling of cold (< 10° C) water in the centre of the cyclonic eddy.

12. **What are the factors underpinning the driving of the Delagoa eddy?** In the Delagoa Bight, off Maputo, the capital of Mozambique, a recurrent and persistent cyclonic eddy is found (see Figures 3 and 5, above). This resident shelf edge circulation is believed to be driven by passing Mozambique eddies, but no firm confirmation for this hypothesis is as yet available. Only one research cruise has been undertaken in the area to study the feature. This eddy is known to influence the shelf circulation, the disposition of river outflows, the dispersion of pollutants and thus the habitat of organisms and potentially the important prawn fisheries. Since this feature is close to the South African border, it may well play an important role in cross-boundary living resources. In order to establish the driving forces for this eddy and its role, satellite remote sensing and a research cruise are required. Mapping of biotopes in this feature and in the adjacent shelf region should be carried out.

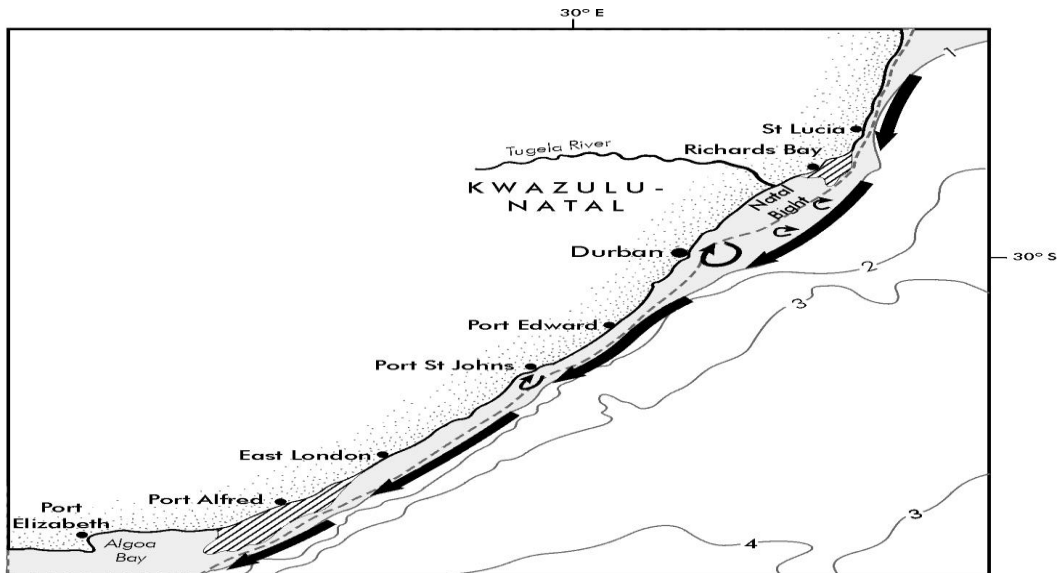
13. **Where does the Agulhas Current start to influence the shelf circulation off Mozambique/South Africa?** It is a remarkable fact that the location at which the Agulhas Current proper starts to affect the motion of shelf waters on the Mozambican/South African shelf is not known. To date this location has only been surmised from patterns of the shelf sediments northeast of Durban (see Figure 6). Knowing this location is crucial not only for an understanding of shelf circulation between Durban and Maputo, but also for a better knowledge of the ecology of cross-boundary living resources and the dispersion of pollutants from Mozambique and Maputoland South. The placement of current meter moorings would be sufficient to fill this important knowledge gap.

14. **What factors contribute to the driving of the St Lucia upwelling cell and what is its effect on the Natal Bight?** The Natal Bight is a semi-enclosed part of the shelf of southern Africa lying between Cape St Lucia and Durban (see Figures 7 and 8). It is the widest part of this shelf region and is bordered on the seaward side by the Agulhas Current. It creates a somewhat specialized habitat with a number of endemic species. Other living resources migrate equatorward to the bight from further downstream. There are some indications that the living resources of the bight are not independent from those across the Mozambican border slightly to the north, making this a relevant case for cross-boundary management. A coastline that is partly highly industrialized and partly used for intensive tourism and eco-tourism borders the Natal Bight. The waters of the bight are therefore the recipient of considerably urban and industrial runoff and pollution. A number of rivers discharge their waters into the region. The marine ecology of the bight is highly unusual. It seems that an upwelling cell at Cape St Lucia, driven by the passing Agulhas Current, supplies all the nutrients to maintain the primary productivity in the bight (see Figure 7). This makes an understanding of this upwelling cell crucial to an understanding of the whole oceanography and ecology of the Natal Bight. Without this understanding, effective management of the living resources is not possible. Currently, there is no information on the variability of the Cape St Lucia upwelling cell, its lasting influence on the waters and ecosystem of the bight as a whole or on the forces that drive the upwelling. Information could be obtained by placing a set of current meter moorings at this upwelling cell.



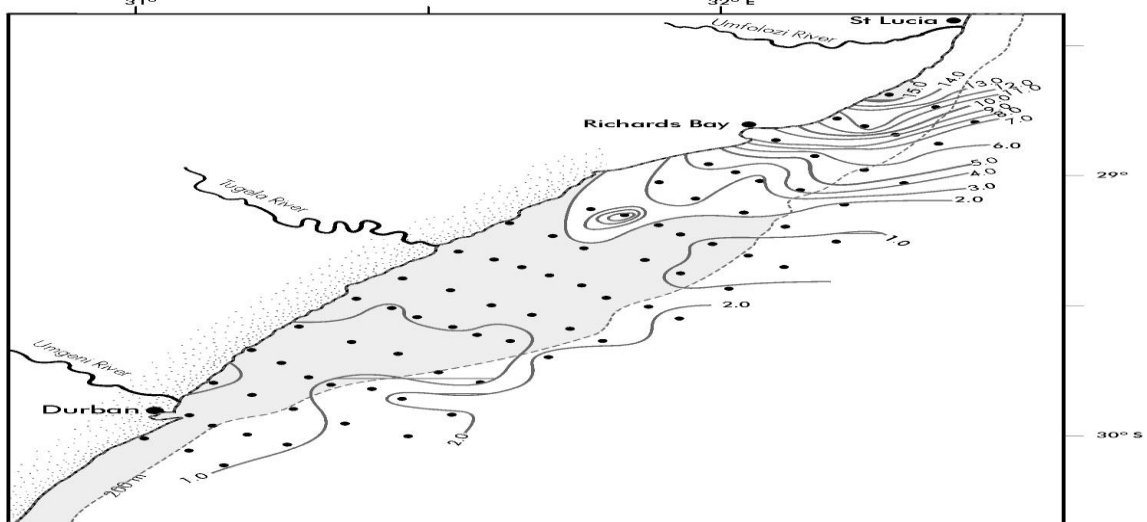
**Figure 6.** The inferred bedload motion along the coastline between South Africa and Mozambique, after Lutjeharms (2004). The bedload parting equatorward of Richards Bay may give an indication of where the Agulhas Current starts having an influence on shelf waters.



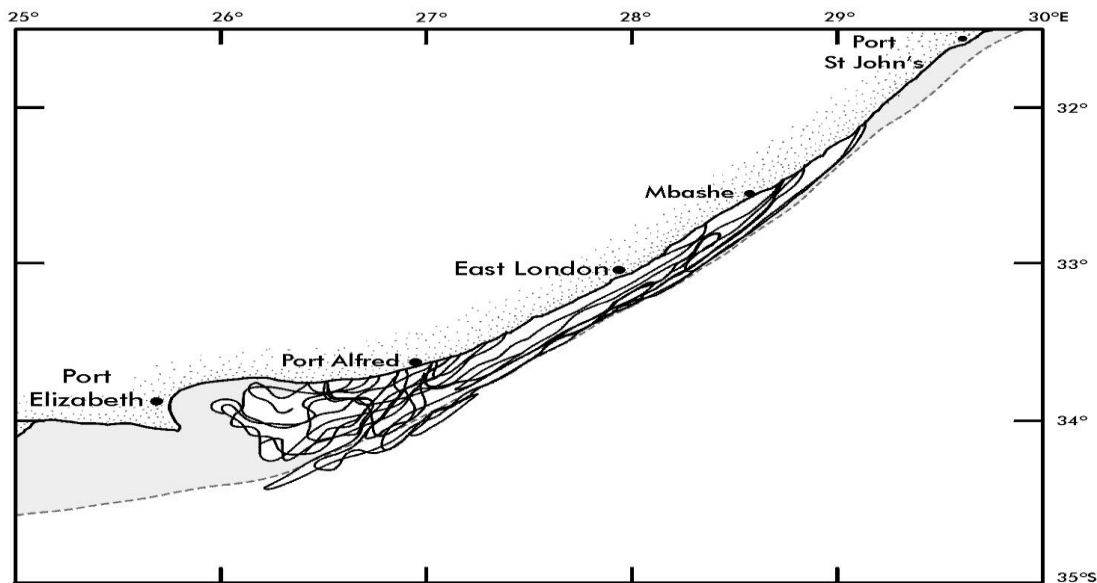


**Figure 7.** A portrayal of the general circulation off the east coast of South Africa. Lined regions denote where upwelling is known to occur; shaded regions are shallower than 1000m. Note the narrowness of the shelf and the way in which the Agulhas Current follows the shelf edge if there is no Natal Pulse present.

13. **What is the effect on shelf water of the Natal Pulse?** The Natal Pulse is an unusual perturbation on the trajectory of the Agulhas Current (see Figure 1 and 7). Its behavior is crucial to an understanding of the Agulhas Current, the Agulhas retroflexion and the role of this current in the global thermohaline circulation. It has also been demonstrated on a few individual occasions that the passing of the Natal Pulse has a dominating effect on the water movement on the adjacent continental shelf by reversing the currents dramatically and instantaneously. This process may play a key role in the movement of organisms along this coastline from the Agulhas Bank to the Natal Bight, in the annual sardine run, in the migration of whales and in the distribution of immotile organisms and larvae. It probably also has a decisive influence on the dispersion of pollutants on the shelf of this region. A proper understanding, based on appropriate data of the effect on shelf waters of the passing of Natal Pulses is essential if the fish resources of the eastern seaboard are to be properly managed.



**Figure 8.** A portrayal of the Cape St Lucia upwelling cell and its influence on the Natal Bight waters. Dots represent station positions. The shaded region is shallower than 200 m.



**Figure 9.** A composite of outlines of cold water (< 17°C) of the Port Alfred upwelling cell, after Lutjeharms, 2004. The shelf shallower than 200m has been shaded.

### What forces drive the Port Alfred upwelling cell and what is its effect on the Agulhas Bank?

14. The Agulhas Bank is a wide part of the shelf at the southern tip of South Africa (see Figure 1). It plays a crucial role in the west coast ecosystem of southern Africa and is thus a prime region for cross-boundary ecosystem management. It is here that the major economically important species such as anchovy and sardine spawn. It has been demonstrated that the environmental conditions on the bank during critical stages of the spawning period are crucial to the success, or failure, of that year class. A full understanding of the hydrodynamic working of the Agulhas Bank is therefore essential to the proper management of these cross-boundary living resources. It has enormous socio-economic consequences, but major knowledge and data gaps exist in this regard. It has been shown that there is a high likelihood that the upwelling cell found at Port Alfred carries cold water onto the shelf and here forms the bottom waters of the whole Agulhas Bank, thus enhancing the seasonal thermocline and creating a favorable habitat for the spawning of fish. The process through which this occurs is not understood. In order to evaluate and understand the role of this upwelling cell, the driving forces need to be evaluated, the variability of the upwelling cell needs to be monitored and the effect of the cold water thus upwelled on the rest of the shelf determined. To answer these questions adequately placement of current meter moorings at the upwelling cell as well as a proper, multi-disciplinary cruise encompassing the whole of the Agulhas Bank quasi-synoptically should be carried out.

### WHAT ARE THE WATER CHARACTERISTICS, WATER QUALITY INDEXES AND WATER CIRCULATION PATTERNS ON THE SHELF REGIONS OF THE ASCLMEs THAT HAVE THE MOST MARKED EFFECTS ON TRANS-BOUNDARY ECOSYSTEMS, AND THUS LIVING MARINE RESOURCES?

15. Water quality of shelf waters have a decided influence on pollution, habitat destruction and thus fisheries and tourism. In many areas of the ASCLMEs there is no information of any kind on the water movement, water characteristics, water quality or the cross-boundary exchanges of water masses and biota. This precludes any management of cross-boundary living resources or biodiversity. Assessments are needed to establish baselines in the shelf areas of WIO Islands, East and West Coast of Madagascar<sup>55</sup>, and coastlines of East Africa<sup>56</sup>.

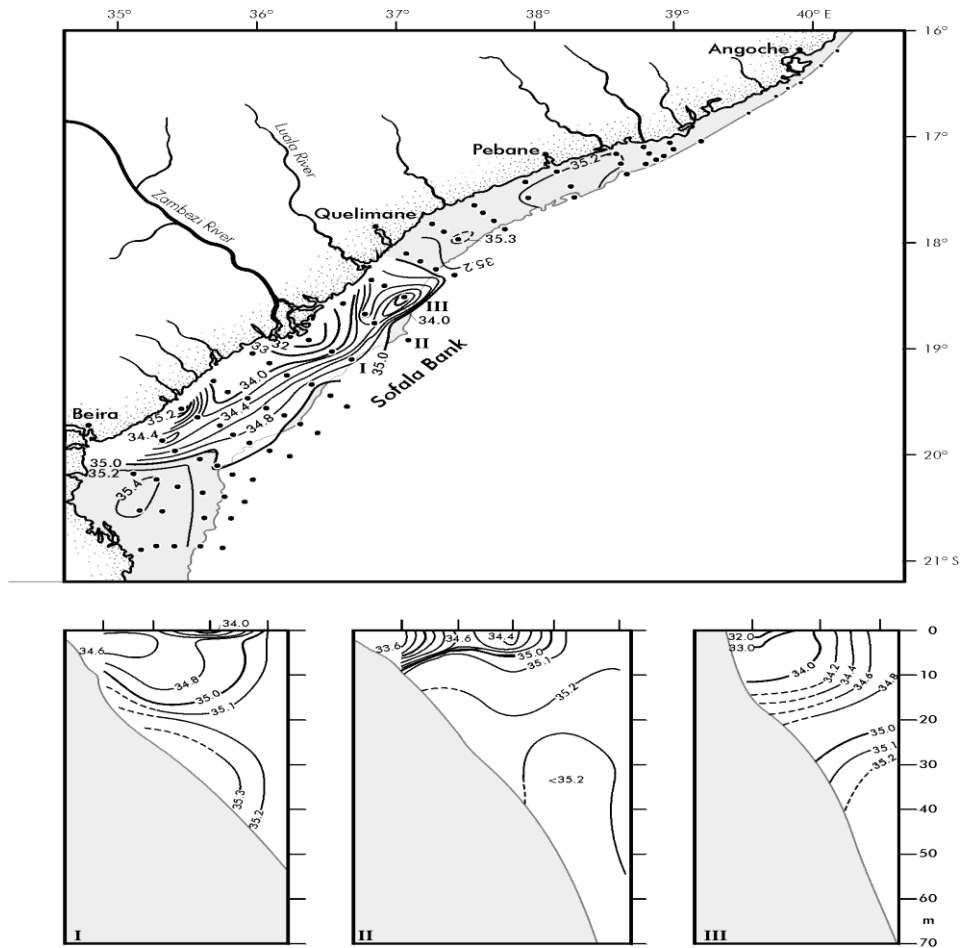
<sup>55</sup> The shelf of Madagascar is in most respects *mare incognitum*. Hardly any measurements of an oceanographic nature have been carried out. The shelf west of Madagascar is wider than the East coast shelf, and is not bordered by a strong western boundary current. The characteristics of its waters and biota may therefore be entirely different.

## WHAT ARE THE MOST IMPORTANT COMPONENTS OF TERRESTRIAL RUN-OFF THAT INFLUENCE COASTAL ECOSYSTEMS AND THEIR HEALTH?

- **Saline and fresh water runoff on the Sofala Bank:** The Sofala Bank is one of the widest and shallowest shelf regions in the proposed ASCLMEs (see Figure 10). It is the recipient of substantial amounts of fresh water from the Zambezi and other rivers as well as saline inputs from the salt marshes in the vicinity of Beira. These inflows are by no means continuous. Occasional summer floods from the Zambezi River could conceivably overwhelm the saline surface waters of a large part of the adjacent shelf, whereas during dry periods the saline fluxes from salt marshes could be dominant. Neither of these hypotheses has been tested by appropriate observations, which is problematic for management purposes as the region supports an important fishery. Little is known about the distribution of biotopes and the habitats have not been adequately classified.
- **Limpopo runoff on the ecosystem of the Delagoa Bight:** One of the largest rivers in the ASCLMEs region is the Limpopo River that drains into the Delagoa Bight (see Figure 5). It has been conjectured that the economically important prawn fisheries of this region benefits from the organic material contributed by the runoff from this river. Biotopes in the region have not been adequately mapped nor have complete taxonomic determinations been carried out. Investigations using satellite remote sensing and well-focused hydrographic observations in the Delagoa Bight would go a long way to filling some of the knowledge gaps currently hindering management.
- **River runoffs from Madagascar:** All the criteria for including land runoff onto adjacent shelves in a list of priority actions hold equally for the river runoffs from Madagascar. These include filling knowledge gaps needed better to manage living resources, biodiversity and possible cross-boundary fish stocks. Biotopes need to be mapped and potential living resources identified. However, there seems to be no information whatsoever on the influence of river runoff on the Madagascar shelves. Two ways of approaching this information gap are foreseen. One is to include such an investigation in an exploratory cruise on the shelves of Madagascar and its adjacent current systems. The other, perhaps complementary, study would involve smaller vessels that could carry out monitoring work on a more regular basis at predetermined locations.

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<sup>56</sup> The shelf waters of the Somali system are of substantial importance for the artisanal fisheries of the East African coast. A question that needs to be addressed is how dependent is the shelf circulation on the reversing monsoonal winds and how much on the seasonality of the offshore Somali Current? How much does this vary from year to year and what impact does this variation have on the fish stocks, it at all?



**Figure 10.** One-time observations of the effect of freshwater runoff from the Zambezi River on the waters of the Sofala Bank in the Mozambique Channel. The upper panel shows the salinities at the sea surface with low salinity region not shaded. The lower panel shows three vertical sections – marked in the upper panel – of salinity. Dots denote station position in the upper panel, vertical marks the same in the lower panels.

## ANNEX 8: PROGRAMME AREAS, LME MODULE, AND FUNDING SOURCE

<b>Programme Area</b>	<b>Interventions/LME Module</b>	<b>Funding Source</b>
<i>ASCLMEs Project Objective: To fill prioritised knowledge gaps in understanding of transboundary living resources of the two LMEs and to build capacity of the participating countries to utilize this improved understanding for more effective management through use of a modular approach to ecosystem management.</i>	<p>Four specific Outcomes:</p> <ul style="list-style-type: none"> <li>• Filling of key identified knowledge and information gaps (Productivity Module/ fisheries and pollution module)</li> <li>• Building project, Programme and Long-term monitoring and evaluation system Governance and Socio-economic Module);</li> <li>• Mainstreaming (Governance and Socio-economic Module); and</li> <li>• Public Participation Programme (Socio-economic Module).</li> </ul>	ASCLMEs Project, with additional financial contributions from SWIOFP for joint cruises, and WIO-LaB for public participation activities.
<i>Outcome: Key environmental knowledge gaps are filled as necessary to install an ecosystem approach to LME management;</i>	Fill gaps in identified priority areas in oceanographic processes and environmental variability ((Productivity, fisheries and Pollution and Ecosystem Health Modules): Specifically, among others, system productivity in near-shore and off-shore area; larval transport; anthropogenically induced environmental variability; role of gyres and eddies in productivity	ASCLMEs Project, with support from SWIOFP on joint cruises, and WIO-LaB on near-shore areas of productivity in relation to pollution hotspots.
<i>Outcome: Decision-making tools are in place, to facilitate the synthesis and application of data for LME management;</i>	Defraying country and regionally based transaction costs to jointly establish monitoring and evaluation approaches based on IW indicators. (Socio-economic, Governance, and Fish and Fisheries Modules)	ASCLMEs Project, working with WIO-LaB for M&E related to coastal land based sources pollution, and SWIOFP for issues related to demersal, pelagic and crustacean fisheries.
<i>Outcome: Foundational capacities are in place to assure the sustainability of assessment and data management activities to be undertaken in the sap implementation phase;</i>	<p>1) Defraying the transaction costs of national and regional discussions aimed at legislative and regulatory changes consistent Programme and project objectives, donor recruitment, and the establishment of other mechanisms aimed at Programme and project financial sustainability (Governance Module).</p> <p>2) Capacity building during project implementation and leveraging of resources to assist countries retain trained personnel (Socio-economic Module).</p>	<p>1) ASCLMEs Project working with WB and UNEP partners in the areas of donor recruitment and other measures aimed at leveraging necessary human and financial investments to achieve sustainability of management and Programme and project outcomes.</p> <p>2) ASCLMEs Projects working with WIO-LaB on capacity building for the pollution and ecosystem health module of the MA, and with SWIOFP on the fish and fisheries module.</p>
<i>Outcome: A Comprehensive Public Participation Initiative Enables Stakeholders to Engage in Programme activities.</i>	<p>1) De-mystifying science to benefit of Stakeholders (Socio-economic Module);</p> <p>2) Stakeholder forums (Socio-economic Module);</p> <p>3) Environmental Education Initiatives (Socio-economic Module);</p> <p>4) Establishment of Project and Programme Web Site (Socio-</p>	ASCLMEs Project with additional support from WIO-LaB for stakeholder for a, and from SWIOFP and WIO-LaB for establishment and maintenance of Programme component of the dedicated web site.

	economic Module).	
<p><b>SWIOFP Project Objective:</b>  <i>(i) To identify and study exploitable offshore fish stocks within the SWIO, and differentiate between environmental and anthropogenic impacts; (ii) To develop institutional and human capacity through training and career building. (iii) To develop a regional fisheries management structure and associated harmonized legislation in collaboration with the SWIOFC.</i></p>	<p>Seven specific Outcomes:  (Fish and Fisheries, Socio-economic, Pollution and Ecosystem Health and Governance Modules)</p> <ul style="list-style-type: none"> <li>• Identify exploitable offshore fish stocks; develop inst. Capacity; develop regional fisheries management. (Fish and Fisheries Module));</li> <li>• Do baseline assessment and assess crustacean fisheries by-catch (Fish and Fisheries Module);</li> <li>• Do baseline assessment of demersal stocks in targeted areas;</li> <li>• Develop and test fisheries monitoring techniques;</li> <li>• Baseline assessment of fisheries interactions with non-consumptive marine; and Strengthen national fisheries management.</li> </ul>	<p>SWIOFP, in collaboration with ASCLMEs Project and WIO-LaB in relation to capacity building and fisheries interactions with non-consumptive resources.</p>
<p><i>Outcome: Regional database piloted and ranked effective by majority of SWIOFP countries (Fish and Fisheries and Socio-economic Modules); Production of a gap-analysis which identifies gaps in knowledge of SWIO fisheries resources and presents research agenda to be implemented by SWIOFP (Fish and Fisheries Module); historic data identified for inclusion in database/data atlas sourced or entered into database Regional fisheries database fully operational and inclusive (Fish and Fisheries and Socio-economic Modules); National fisheries related IT and communications infrastructure procured or upgraded (Fish and Fisheries and Socio-economic Module); and Training in data handling and reporting provided ( Fisheries and Socio-economic Modules).</i></p>	<p>Regional database piloted and ranked effective by majority of SWIOFP countries (Fish and Fisheries and Socio-economic Modules); Production of a gap-analysis which identifies gaps in knowledge of SWIO fisheries resources and presents research agenda to be implemented by SWIOFP (Fish and Fisheries Module); historic data identified for inclusion in database/data atlas sourced or entered into database Regional fisheries database fully operational and inclusive (Fish and Fisheries and Socio-economic Modules); National fisheries related IT and communications infrastructure procured or upgraded for each of nine SWIOFP countries (Fish and Fisheries and Socio-economic Module); and Training in data handling and reporting provided for each of nine SWIOFP countries (Fish and Fisheries and Socio-economic Modules).</p>	<p>SWIOFP, with assistance from ASCLMEs Project on data base creation and gaps in knowledge on fisheries information.</p>
<p><i>Outcome: (I) Baseline assessment of shallow and deep water crustacean stocks and fisheries in the EEZs of Mozambique, Kenya, South Africa, Tanzania, Seychelles, Madagascar and Comoros. (ii) Assessment of crustacean fisheries by-catch, evaluation of discard impacts, testing of exclusion devices, and</i></p>	<p>Survey methodology defined and found scientifically sound (Fish and Fisheries Module); Seven ship-based surveys and data collection exercises to assess the potential of new and existing fisheries (Fish and Fisheries Module); Production of preliminary country reports and consolidated sub-regional reports on status of</p>	<p>SWIOFP, and in cooperation with ASCLMEs Project on ecosystem measurements.</p>

<p><i>measurements of ecosystems impacts in selected areas of the SWIO.</i></p>	<p>crustacean fisheries (Fish and Fisheries and Socio-economics Modules); pilot studies on optimizing artisanal shallow-water lobster fisheries completed</p>	
<p><i>Outcome: (i) Baseline assessment of demersal stocks and fisheries in the EEZs of Kenya, Tanzania, Mozambique, South Africa, Seychelles, Comoros and Madagascar.</i></p>	<p>Survey methodology defined and found scientifically sound (Fish and Fisheries Module); ship-based surveys and data collection exercises to assess the potential of new and existing fisheries (Fish and Fisheries Module); Production of preliminary country reports (Fish and Fisheries and Socio-economic Modules); and consolidated sub-regional reports on status of demersal fisheries (Fish and Fisheries and Socio-economics Modules).</p>	<p>SWIOFP</p>
<p><i>Outcome: Monitoring of fishing effort and catch. Development and testing of fisheries monitoring techniques and linkage of communication infrastructure and development of coordination mechanisms and verification systems.</i></p>	<p>Scientific sea observers trained (Fish and Fisheries Module); Improvement in frequency and coverage of national monitoring activities in each country (Fish and Fisheries and Socio-economic Modules); Initiation of land based monitoring and data verification systems in at least half of participating countries (Fish and Fisheries, Socio-economics, and Governance Modules); Initiation of discharge monitoring Programme in at least half of participating countries (Pollution and Ecosystem health and Governance Modules); Two aerial surveys and data collection to monitor fishing effort in select areas of the SWIO (Fish and Fisheries and Socio-economics Modules); and Initiation of a regional Vessel Monitoring System (Fish and Fisheries and Governance Modules)</p>	<p>SWIOFP, in cooperation with ASCLMEs Project and WIO-LaB on development of monitoring systems.</p>
<p><i>Outcome: Baseline assessment of fisheries interactions with non-consumptive marine resources and assessment of marine biodiversity as alternative sources of income</i></p>	<p>Development of guidelines for research grant proposals completed (Fish and Fisheries and Socio-economics Modules); Research studies on interaction between commercial and non commercial marine resources or potential alternative livelihoods completed (Fish and Fisheries and Socio-economics Modules); Key marine species GIS mapped SWIOFP countries (all except Réunion) (Pollution and Ecosystem health Module); and bio-indicator species identified and relationships between target species and</p>	<p>SWIOFP, in cooperation with ASCLMEs Project on GIS work and key marine species.</p>

	ecosystem health established (Fisheries and Socio-economics Modules).	
<i>Outcome: Strengthening of Regional and National Fisheries Management. Development of regional fisheries management framework and support to regional and national fisheries management bodies.</i>	Evaluation of national fisheries regulations and identification of areas where harmonization is needed completed (Fish and Fisheries and Governance Modules); Establishment of working relationship and technical support between SWIOFP and Southwest Indian Ocean Fisheries (Fish and Fisheries and Governance Modules); Regional PMU and national project offices in place; and national level workshops to disseminate project outputs and develop follow on activities (Socio-economics Module).	SWIOFP, with collaboration of ASCLMEs Project and WIO-LaB on harmonization and workshop activities.
<b>WIO-LaB Project Objective:</b> <i>To fill prioritised knowledge gaps in understanding of transboundary living resources of the two LMEs and to build capacity of the participating countries to utilize this improved understanding for more effective management through use of a modular approach to ecosystem management.</i>	Three specific Outcomes: (Governance, Socio-economics and Pollution and Environmental health Modules) <ul style="list-style-type: none"> <li>• Strengthen regional legal basis for preventing land-based sources of pollution;</li> <li>• Reduce ecosystem stress through sediment and water quality improvements;</li> <li>• Develop regional capacity and strengthen institutions for sustainable, less polluting environment.</li> </ul>	WIO-LaB
<i>Strengthen regional legal basis for preventing land-based sources of pollution</i>	Gaps identified in legal/regulatory regimes (Governance Module), ratification of international agreements (Governance Module); Regional EIA process (Governance and Socio-economic Modules); and National Plans of Action (Pollution and Ecosystem Health Modules).	WIO-LaB
<i>Outcome: Reduce stress to the ecosystem by improving water and sediment quality</i>	Common regional monitoring methods agreed and pilot monitoring carried out (Governance Module); Improved knowledge of priority pollutants and carrying capacity; Regionally agreed EQOs and water-based EQSs (Pollution and Ecosystem health Module); and Six demonstration projects successfully implemented (Pollution and Ecosystem Health Module).	WIO-LaB
<i>Outcome: Develop regional capacity and strengthen institutions for sustainable, less polluting development</i>	Sustainable framework for managing land-based sources, including updated TDAs/SAPs (Governance and Socio-economic Module); Enhanced capacity developed for sustainable environmental management in region (Governance Module); and Fully involved stakeholders and	WIO-LaB, with strong support from SWIOFP and ASCLMEs Project for finalization of the TDAs and SAPs



	improved civil society (Socio-economics Module).	
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## ANNEX 9: PLANNING AND STRATEGY FOR THE OCEANOGRAPHIC SURVEYS ASSOCIATED WITH THE ASCLMEs PROJECT

### PROCEDURAL:

The Project will develop an Oceanographic Survey Workplan and Strategy during its first months (and prior to the oceanographic field –work), which will include the following components:

- a) A final review of current knowledge to re-confirm ‘gaps’ in the oceanographic record to guide the planned cruises.
- b) Identification of a detailed oceanographic survey plan for the ASCLMEs project lifecycle (locations, vessels, timing, data collection and analyzes, databases to be developed, etc). This will include a contingency plan to extend/ expand survey sites or methodology as necessary to address newly identified gaps.
- c) Elaboration of a training and capacity building Programme through a selected counter-parting process using both regional specialists and those experts associated with the survey vessels and their home institutions.
- d) Identification of local/regional institutes and personnel most appropriate for the shipboard training and capacity building Programme. This may also include appropriate training periods (especially for data analyzes) at the vessel ‘home’ institutes.
- e) Elaboration of a data handling (including quality assurance and control) and storage Programme to include clear definition of the management uses and operational values of the data, and how the data would be targeted at management agencies and institutions.
- f) Adoption of an effective coordination mechanism for the various oceanographic and fisheries cruises and use of vessel-time between the three projects under the overall Programme for the ASCLMEs. This mechanism will also seek to develop cooperative partnerships with other field-work initiatives which may be identified within the region and which could help to build the information database or provide further training opportunities.

*N.B. Items c) and d) will feed into the Project’s overall Capacity Building and Training Programme.*

This Workplan and Strategy will be discussed by the Cruise Coordinating Group (which will include representation from the other GEF projects within the ASCLMEs Programme), in the invited presence of other pertinent stakeholder observers, at a cruise design workshop to ensure all parties are clear of the aims and deliverables as well as the cruise locations and timing. Furthermore, there will be mid-term and ‘end-of-surveys’ coordination workshops to ‘progress-chase’ and steer the cruise Programme and ensure capture of the necessary data to fill the priority gaps. These 3 workshops (Cruise Design, Mid Term Coordination and ‘End-of-Surveys’ coordination) will also address any need for additional cruises or extensions to existing cruise-plans in order to cover unforeseen data needs by way of a ‘contingency’ approach

### METHODOLOGY:

Oceanographic survey cruises will collect information on the parameters listed below:

PHYSICAL PARAMETERS	CHEMICAL PARAMETERS	BIOLOGICAL PARAMETERS
Air and Sea Temperature	pH	Plankton Identification
Salinity	Dissolved Oxygen	Zooplankton Population Assessment
Conductivity	Chlorophyll Concentration	Phytoplankton Growth and Distribution
Density (derived variable)	Sediment Characteristics	Benthic sampling

PHYSICAL PARAMETERS	CHEMICAL PARAMETERS	BIOLOGICAL PARAMETERS
Sea Surface Height	Nutrient Levels	
Current Velocity/Direction	Heavy Metals	
Solar Radiation/Available Light	Persistent Organic Pollutants	
Bathymetry		
Sediment Characteristics		
Sea Floor Mapping/Acoustics		
Wind Velocity/Direction		

Remote sensing and GIS data coordination methodologies will be used to integrate this data and to provide overall data mapping for the LMEs. In addition moored instrument arrays will be used in selected areas to collect information on temporal shifts in parameters at fixed points. This will help to rationalize the spatial data collected across the survey areas.

The survey vessel(s) will deploy a state of the art undulating array that can “shuttle” up and down the water column, and represents the latest in monitoring technology and, more specifically, includes within a single device the following capabilities:

- Fast Repetition Rate Fluorometer (FRRF), which measures the growth rate of phytoplankton electronically, in real time, without the time-consuming laboratory procedures required by traditional methods. The FRRF serves as an effective and cost efficient alternative to the traditional use of <sup>14</sup>C incubation, which is time consuming, labor intensive, and brings with it the expense and logistical complications of dealing with a radioisotope;
- Optical Plankton Counter (OPC), which measures the number and size of zooplankton by putting a curtain of light across a tunnel through which the water flows. When a zooplankter interrupts that curtain, it is recorded. The animal’s size is estimated from the size of the interruption;
- Photosynthetic Active Radiation (PAR), which will measure how much light is available for photosynthesis at different depths;
- Conductivity, Temperature, and Depth (CTD) Fluorometers, which measure salinity, temperature, depth, and chlorophyll concentrations;
- Dissolved Oxygen Electrode, which measures concentrations of dissolved oxygen; and a
- Continuous Plankton Recorder (CPR), which captures zooplankton between two layers of silk mesh, making a “sandwich” that secures the creatures for later counting under a microscope.

The survey vessel(s) will also deploy a series of sondes, which create time series datasets that allow managers to identify long-term patterns as well as track short-term influences such as weather. A sonde is approximately the size of a roll of paper towels and contains electronic sensors that measure temperature, salinity, dissolved oxygen, pH, sea surface height and current velocity/direction. The data from these sondes will be combined with data from the undulating towed array thus forming complementary data sets. The sondes will provide excellent temporal resolutions but have limited spatial resolution capability since each stays at a fixed point, while the towed array datasets will give excellent spatial resolution, both horizontally and vertically, but limited temporal resolution. Together the two databases will provide a new and panoramic view of ecosystem structure and dynamics.

During the cruises, samples will be collected for analyzes of heavy metal concentrations of mercury, selenium, cadmium, copper, zinc, and analyzes of POPs that are listed under the Stockholm Convention and heavy metal concentrations of mercury, selenium, cadmium, copper, zinc, and arsenic in the muscle, liver, and kidney tissue of seabirds and fish, and in the blood and feathers of seabirds.

At the desktop level, information will be integrated through overlays (e.g. satellite-based estimates of primary production, information from fisheries stock assessments, larval transport data, etc). As an example relating

specifically to primary production mapping, satellite images will be generated at a spatial resolution of one kilometer/megapixel. These estimates will be computed using a high resolution (1 km) SeaWiFS and MODIS chlorophyll (C<sub>sat</sub>), AVHR sea surface temperature (SST), and Photosynthetically Active Radiation (PAR), also from SeaWiFS and MODIS in concert with the vertically generalized production model (VGPM) developed by Rehrenfeld and Falkowski (1997). The combination of these technologies will allow a three dimensional distribution of primary production to be computed.

Throughout the survey planning, fieldwork, data analysis and data integration/mapping process an emphasis will be focused on the involvement of regional specialists and the capacity building and training of national and regional scientists (field-workers and data analysts). Beyond this, the primary objectives for the data collection process will also be a priority consideration, those being A. the collection of sufficient and reliable data to inform the TDA/ SAP formulation process, B. the development of a baseline of information for long-term monitoring purposes, and C. the capture of information to inform operational management procedures and policies (i.e. related to the sustainable management of the LME resources).

## ANNEX 10: LINKAGES TO RELATED GEF PROJECTS

GEF Project	Project Emphasis	Main Linkages
<i>Strategic Partnership for Sub-Saharan Africa LMEs (WB/GEF)</i>	The project is to encourage country-level investments aimed at building the capacity of SSA countries to manage their fishery resources. The project will assist countries to undertake the necessary policy, legal, and institutional reforms needed to improve governance of fisheries. This is expected in turn, to provide a framework for leveraging investments in fisheries development and management, including surveillance and enforcement functions.	The ASCLMEs Project will provide information on the physical and chemical oceanography of the ASCLMEs, essential to the management of the area's fisheries. Information generated through the project will be shared with this initiative, with a view to informing the development of policy and institutional frameworks.
<i>Marine Highway Development and Coastal and Marine Contamination and Prevention Project (WB-GEF)</i>	The project's main global environmental objective is to reduce the risk of ship-based environmental contamination (such as oil spills from groundings and illegal discharges of ballast and bilge waters) and the unsustainable exploitation of marine resources (such as illegal fishing and fishing practices). This will be achieved by testing the economic, technical, and institutional feasibility of introducing precision navigation systems, such as an electronically supported marine highway to guide ships through sensitive areas and to monitor the movements and activities of fishing and other vessels operating within territorial waters. The project will also strengthen port state control capabilities.	This project relates directly to the ASCLMEs Programme through its emphasis on contamination (the <i>Pollution and Ecosystem Health</i> module). Close cooperation will be ensured between the respective initiatives particularly in the arena of capacity building to optimise investments. The ASCLMEs will help to define the down stream impacts from pollution in 'hotspots' by generating a better understanding of ocean currents.
<i>Atlantic and Indian Ocean SIDS Integrated Water Resource and Wastewater Management (UNEP/UNDP-GEF)</i>	Envisions a partnership between UNEP and UNDP to address constraints to effective water resource management - an absence of effective strategy and policy; the absence of workable and inter-sectoral legislative and institutional mechanisms, limited financial sustainability; absence of a strategy to deal with extreme or chronic events that threaten the resources (e.g. flooding, drought, saltwater intrusion); lack of access to or awareness of appropriate and cost-effective technologies and methodologies; inadequate management capacity at the institutional and individual level; an imbalance between long-term planning for development and that for resource and environmental sustainability; short-term strategies for the prioritisation of water needs (tourism and agriculture); and inadequate information to support sustainable policy-making and management strategies.	Three SIDS (Mauritius, Comoros, and Seychelles) are participating in both projects. ASCLMEs will generate information on environmental variability crucial to water resource management strategies. The monitoring system will allow this information to be codified and the knowledge management system will ensure it is widely disseminated to water sector planners.
<i>Coral Reef Targeted Research and Capacity Building Project (WB/GEF)</i>	The main objective of this World Bank/GEF project CRTRCBP is filling critical science gaps related to coral reef management. The CRTRCBP will support scientific research to be conducted by an international network of scientists.	This Project will offer excellent opportunities for collaboration with the suite of Projects contemplated for the Agulhas and Somali LMEs, providing science support in relation to coral reefs. The ASCLMEs will share data and information related to natural

GEF Project	Project Emphasis	Main Linkages
		and anthropogenically induced environmental variability that are threatening coral reef systems.
<p><i>Benguela Current LME (UNDP-GEF)</i></p> <p><i>Namibia, South Africa, Angola</i></p>	<p>The Benguela Current runs parallel to the coastline of South West Africa, from the Cape of Good Hope in the South to Northern Angola, and comprises one of four major coastal upwelling systems globally. GEF is providing funding for the implementation of the LME SAP.</p>	<p>A key focus of the LME project is on understanding the determinants and effects of environmental variability in the LME. As the Benguela and Agulhas currents are interconnected, with the latter transferring heat into the former through the formation of Agulhas rings, an understanding of the oceanography of the ASCLMEs is critical to securing a better understanding of the BCLME. Accordingly, close-working relationships will be maintained between the projects – to share information and inform the Assessment Methodology activities.</p>
<p><i>Implementation of the Strategic Action Programme for the Orange-Senqu River Basin (UNDP-GEF)</i></p>	<p>The Project will develop mechanisms to ensure the cooperative and sustainable use of the land and water resources of the Orange River Basin; develop regionally based and agreed upon short, medium, and long term management objectives for the Orange River Basin; build capacity for adaptive management approaches to River Basin management; create a comprehensive stakeholder involvement and public information Programme; and strengthen regionally based institutions, particularly ORASECOM, to ensure the long term sustainability of joint basin management endeavours. The Project will create synergies with and build upon a range of initiatives being undertaken in the Basin by the countries themselves and those of bi-lateral and multi-lateral donors.</p>	<p>A major emphasis in the Orange-Senqu River Basin will be on assessing climatic variability, with a view to informing adaptation strategies. As this variability is closely related to environmental variability in the ASCLMEs, the work planned under ASCLMEs will have tremendous utility for this initiative.</p>
<p><i>IW LEARN</i></p>	<p>The project aims at building the capacity among transboundary water resource projects worldwide, through Internet-based applications, networking within a community of practice, and knowledge management.</p>	<p>The information systems and networking initiatives planned through the project will be closely tied to IW Learn information systems. Provision is made for south-south knowledge transfer, which would benefit from the IW Learn network, and the participation of project stakeholders in IW Learn sponsored conventions, including the biennial GEF IW Conference.</p>
<p><i>Marine and Coastal Biodiversity Projects</i></p> <p><i>Madagascar, Mauritius, Mozambique, Seychelles,</i></p>	<p>The GEF is supporting a number of projects under the biodiversity focal area, aimed 1] strengthening national systems of PAs (Mauritius, Madagascar, South Africa); or 2] strengthening the framework for Integrated</p>	<p>The suite of projects in the region is addressing direct threats to coastal and marine biodiversity at particular sites. However, these efforts are somewhat hampered</p>

<b>GEF Project</b>	<b>Project Emphasis</b>	<b>Main Linkages</b>
South Africa, Tanzania	Coastal Zone Management. Amongst other things, these initiatives are designing MPAs in order to optimize the benefits to fisheries, through increasing spawning biomass and through optimizing recruitment into target populations.	by limited access to oceanographic information, needed to map larval transport systems and identify critical areas for conservation; and identify key refugia from climate change (i.e. coral reefs affected by upwelling cells). These initiatives will be key recipient of knowledge dissemination efforts on these subjects under the ASCLMEs Project through DLIST.

## ANNEX 11: RESPONSE TO STAP REVIEWS

N.B. In view of the complexity of dealing with two LMEs in an area where baseline information is frequently missing, the Project requested two STAP reviews, one from A. A reviewer with a marine chemical and oceanography background and one from B. a Living Marine Resources Specialist with experience of the Indian Ocean. The STAP Reviews are appended immediately following the RESPONSE.

STAP COMMENT	RESPONSE TO COMMENT	REFERENCE TO PRODOC
<p>Strategy and logistics for conduct of hydrographic work is inadequately explained. More detail is required on the proposed oceanographic cruise Programme. The project is deficient in omitting, probably as an annex, a summary of the circulation and structure of the waters in the region in the context of known oceanic circulation. The description of planned oceanographic surveys is neither adequately detailed nor placed in the context of prevailing patterns of circulation in the Indian Ocean and the two subject systems.</p>	<p>1. A summary of the circulation and structure of the waters in the region has been added . 2. The Project activities under Outcome 1 have been modified to include a planning and strategy process for the oceanographic cruises, with linkage to an additional Annex that explains how this planning will take place and how a strategy will be developed.</p>	<p>1. See <b>Annex 2 - A Summary of Oceanographic Knowledge in the Agulhas &amp; Somali Current LMEs</b>. 2. See main ProDoc text under <b>Outcome 1</b> for new activities plus <b>Annex 9 - Planning and Strategy for the Oceanographic Surveys Associated with the ASCLMEs project</b>.</p>
<p>It is very important that the perception of the project in the participating countries and the international community is not one of it being a data-collecting exercise for overseas academics. Any plans and strategies developed for the field-work must include a training and counter-parting component to ensure that data collection and analysis techniques are captured within institutes through the capacity building of regional scientists.</p>	<p>The Planning and Strategy for the Oceanographic Surveys Associated with the ASCLMEs project (as noted above) will also address training needs and counterparting arrangements, and a clear emphasis will be made on building capacity within the appropriate national and regional institutes so as to capture and enhance skills within the region</p>	<p>See <b>Annex 9 - Planning and Strategy for the Oceanographic Surveys Associated with the ASCLMEs project</b>. See also <b>Outcome 3 - Output 3.2</b>. Additional explanation provided regarding a Capacity Building and Training Programme within the Project</p>
<p>Inadequate specification of the mechanisms and procedures for the coordination of the oceanographic surveys among the three companion GEF WIO projects and existing work being undertaken with the Norwegian Research vessel</p>	<p>Preliminary coordination of needs has been undertaken during the PDF B to define the expected number of cruises and ship's time, along with agreements on sharing of cruises. This would need to be refined once all three projects are under implementation and timing can be better coordinated (along with the availability of the relevant vessels). Such a coordination mechanism and planning arrangements will be covered in the earliest stages of the Project under Outcome 1 which will include development of the strategy and logistics for the oceanographic cruises</p>	<p>See <b>Annex 9 - Planning and Strategy for the Oceanographic Surveys Associated with the ASCLMEs project</b>. Also discussion on <b>Cruise Coordinating Group under Executing Arrangements</b></p>
<p>Document needs clearer justification for the proposed oceanographic work and whether the information to be gained from this work is the only information required. A clear and forceful statement is needed to defuse any potential criticism of too much 'science and research'.</p>	<p>The information from the oceanographic work is not the only information required or sought but needs to be seen in context with the other project Outputs and the other Programme initiatives by UNEP (Land-based sources) and the World Bank (fisheries). The real purpose of this project is to recognize and fill information gaps across the LMEs through an environmental baseline assessment, and then to use this information to drive a TDA process and arrive at SAP(s). Again, lessons have been learned from previous LME projects that indicate the absolute necessity to capture accurate and adequate baseline data and information to support the long-term management process. A SAP can only be as effective as the TDA that advises it and provides it with priorities and recommendations. A TDA can only be efficient and accurate if it has this baseline data to inform it and from which to draw its LME-wide conclusions.</p>	<p>Discussion on project Outputs under <b>Outcome 1</b> expanded to include coastal data capture on larval transport, mapping of nursery areas and artisanal fisheries. A table has also been added showing the expected management applications of the new data and knowledge as relates to the LME modular approach which should clearly defuse any suggestions that the project is undertaking 'too much science and research' or 'doing science for science's sake'</p>



STAP COMMENT	RESPONSE TO COMMENT	REFERENCE TO PRODOC
The baseline knowledge used for the design of the capacity-building component is not adequately explained	The project will undertake an early assessment of baseline knowledge, available expertise and potential human resources for training within the region. This will flow into the development of a CB&T workplan and strategy that will identify CB&T needs at the national and regional level. Sustainability mechanisms will be identified for CB&T to ensure that the capacity and the trained personnel remain available within the appropriate institutes.	<b>Outcome 3</b> - Text expanded to include explanation and elaboration of the CB&T Programme within the project
Justification for including so called 'pollution' (actually 'contamination') studies in proposal is weak	The need to capture baseline information for long-term monitoring purposes should be considered to be sufficient justification. There is also justification for these studies on the basis of being able to compare any new data on heavy metals and POPS within tissues etc., with other data from the Indian Ocean and globally. This could tell scientists in the region a lot about the chronic and cumulative concerns regarding these pollutants. This has important implications for human health in an area that is very dependent on marine resources as a source of nutrition. However, the information also has a valuable role to play in the TDA process (where are the impacts of such pollutants being felt and what are their origins). If the TDA is properly conducted in collaboration with the UNEP WIO-LaB Project then it should be possible to start to develop linkages between sources/causes and impacts/effects.	See expanded text in <b>Outcome 1 - Output 1.2</b>
Neither does the inclusion of this contaminant component immediately appear to align with the conclusions of the GIWA Assessment of this region	The only completed GIWA assessment for this region addresses the Indian Ocean Islands. In this context GIWA clearly identifies pollution as the most important transboundary concern. GIWA has yet to finalise its assessments of the Agulhas Current and Somali Current regions.	See expanded text in <b>Outcome 1 - Output 1.2</b>
Without an explanation of the meaning of the ' <b>ecosystem approach</b> ' in scientific terms and how it influences strategic aspects of the project design, reference to the phrase is meaningless	The Ecosystem Approach and the concept of Large Marine Ecosystems are a central tenet of the GEF International Waters Operational Strategy and overall business policy, including where it relates to its function as the funding instrument for the Convention on Biological Diversity. Explanation of the ecosystem approach in relation to LMEs and the need for affect transboundary assessment and analysis is now included in the text along with an explanation of how it influences strategic aspects of the project design. The WSSD Plan of Implementation also addresses the need for the Ecosystem Approach, especially in relation to fisheries. This is covered in the ProDoc under the section on the <b>Ecosystem Approach</b> as well as under <b>Country Eligibility</b> .	See <b>Ecosystem Approach</b> section under <b>Part Two - Project Strategy</b> . See also <b>Country Eligibility</b> for further reference to the WSSD. See also <b>Expected Global, National and Local Benefits</b> for a more detailed reference to the WSSD PoI and how it relates to this Project
There is . an underlying conviction that capacity building and stakeholder involvement can be prosecuted prior to the commencement of the TDA process. There is a danger that (this) may not be undertaken in a manner that most appropriately matches the requirements identified through the conduct of a systematic TDA	Capacity building at the basic, foundation level will be necessary from the very beginning of the project. This is a clear lesson that has arisen from other GEF projects and is now seen to be an essential imperative in order for all stakeholders to understand and address many of the technical challenges within an LME project of this nature. Although not intended to be seen in isolation or uncoupled from the TDA process, there are a number of basic CB&T requirements that can be addressed during the assessment stage and prior to the TDA. Indeed, some of this would be introductory to the TDA process and that process itself will constitute a training exercise for many stakeholders. Such training can only improve the chances for sustainability (e.g. long-term monitoring and assessment beyond the baseline to drive management processes)	See <b>Outcome 3 - Outputs and Activities 3.2 and 3.5</b>

STAP COMMENT	RESPONSE TO COMMENT	REFERENCE TO PRODOC
<p>The Project does not adequately describe the precise mechanisms of TDA-SAP preparation among the 3 interrelated GEF WIO projects. More clarity is required on how this project integrates with the UNEP and WB components</p>	<p>Document has been amended in order to clarify these mechanisms</p>	<p>See <b>Outcome 3 - Output and Activity 3.5</b></p>
<p>There could be valid criticism for including 2 LMEs, which are for the most part independent (by definition) under the same roof. A more specific and focused proposal, primarily addressing the Agulhas system, with a reduced or eliminated contaminant component would have lower risks than those associated with (this) wide ranging proposal. There is no explanation or justification of why the two LMEs are grouped together in one project. Such a justification would seem necessary if the current system boundary for the project (which is not really clear in any case) is to be maintained. The Project needs more biogeographic justification to be credible. A comment to the effect that the TDA/SAP process will resolve system boundary issues would be acceptable, but some definition of why the areas were selected would benefit the document. The Project Document should make it clear that one of the primary functions of the TDA and SAP process will be to define boundaries between ecosystems for further development of regional management strategies including long term monitoring strategies</p>	<p>An explanation for the multiple LME approach and the need to look at the wider regional picture has now been added to the Project Document</p>	<p>See new text under introductory section to <b>Project Objectives, Outcomes and Outputs/Activities</b></p>
<p>Project is . Inappropriately arranged in places with occasional, unnecessary repetition and some omissions. More work should be done on its presentation, arrangement and detail</p>	<p>Following the STAP Review, the original Project Document has now benefited from a more careful and cautious review and revision. The presentation and the structure is now believed to be much improved</p>	<p>Various changes to the text to improve the flow and logic</p>
<p>Work on the Somali LME may prove difficult due to the political situation in the north of the region. This biogeographic issue needs to be clarified and justified.</p>	<p>The Project document had been amended to clarify the intention to address the entire Western Indian Ocean region in assessing the ecosystem parameters of the various LMEs (Agulhas Current, Somali Current and possible Mascarene Plateau LME). The political difficulties within the northern area of the SCLME have been noted. The Project will aim to complete a preliminary TDA for the southern section of the Somali Current (i.e. the East African Coastal Current area) which will provide a benchmark for eventual completion of a TDA and SAP for this LME once the political situation stabilizes</p>	<p>See relevant Paras under <b>Project Objectives, Outcomes and Outputs/Activities</b></p>

STAP COMMENT	RESPONSE TO COMMENT	REFERENCE TO PRODOC
Some of the proposals for institutional strengthening, data processing, training and public participation are lacking in detail and require some work to develop fully	A workplan and strategy will be developed as part of a CB&T Programme, which will address the need for more detail on institutional strengthening and training. A Public Participation plan is included in the Project Document. DLIST also represents a major platform for public participation within the Project. Outcome 2 identifies the fact that 'a coordinated regional framework will be developed to facilitate acquisition, distillation and dissemination of data'. The project will also facilitate regional discussions to decide upon the mechanisms for synthesizing country and regional data, and for repatriating and incorporating extra-regional information. These strategies will include a regional information clearing house linked to national information focal centers.	<b>Outcome 3.2</b> addresses the intention to develop a CB&T Programme in the early stages of Project Implementation. <b>Outcome 2</b> identifies the intent to develop a coordinated regional framework and clearing house for data handling
It is difficult to distinguish the coverage of these investigations (UNDP Project) from those intended to be carried out under the sister GEF/World Bank implemented SWIOFP project because Annex 5 provides insufficient clarification, is confusing, and provides inadequate explanation of the way these projects dovetail	Annex 5 and accompanying text has been amended to clarify the distinction between the three ASCLMEs Programmatic projects and to explain how they will dovetail	Both the sections on the <b>Programmatic Approach</b> and on <b>Inter-linkages between Programme Interventions</b> have been expanded and summary annex added (Annex 5) detailing the objectives and outputs of the two sister projects (WIO-LaB and SWIOFP) in relation to the GEF UNDP ASCLMEs project. Also the text under <b>Interlinkages Between Programme Interventions</b> has been expanded to explain the relationship between the three projects in the context of the TDA and SAP process. Also new text added to <b>Implementing Agency Consultations, Linkages and Cooperation</b>
(The project) makes no direct reference to the most deterministic (i.e. inevitable) effect of increased atmospheric CO2, namely ocean acidification	The Project Document has been amended to include suitable reference to climate change in relation to ocean acidification	New para added under Threats description
Has any consideration been given to connections/collaboration with other investigations and organizations (such as IOC and SCOR) that have interests in ocean circulation studies and marine environmental protection issues?	Yes, in preparing the assessments needs due discussion was held with IOC, SCOR and other interested parties/stakeholders. However, it should be noted that the Project will further involve such interested parties and stakeholders in the evolution and design of the strategy and logistics for the oceanographic cruises through the work of the Cruise Coordinating Group and the Cruise Coordinator	No amendment required

STAP COMMENT	RESPONSE TO COMMENT	REFERENCE TO PRODOC
The document could do more to capitalise on the good points or innovative approaches of the intended project strategy (e.g. more emphasis on economic studies as a tool for high-level government awareness, the need to define clearly the ecosystem boundaries within the region, etc).	The Project document has been amended to make stronger reference to the need and delivery of the economic studies for awareness purposes, and the need for clearer ecosystem boundaries to be defined/agreed within the ASCLMEs region	New text relating to economic studies added to <b>Output 3.1</b> . See also new text under introductory section to <b>Project Objectives, Outcomes and Outputs/Activities</b>
The Project Document would benefit from a clear map of the project area. (N.B. Annex 2, Map of bathymetry is confusing and needs to be clarified).	Document Amended	New Map ( <b>Figure 1</b> ) at front of ProDoc before <b>Section 1: Project Rationale</b>
There is very little reference to coastal linkages and issues and similarly there is little reference to the association between globally significant biodiversity (e.g. related to coral reefs and sea-mounts) and the LMEs. Also, the clarification (of the justification for the emphasis on the oceanographic cruises) should extend to why the coastal waters are being effectively ignored by the UNDP project. One of the big concerns within this region should be the upstream-downstream relationship between coral reefs and associated species. There is much evidence that coral reef systems are supported by upstream (up-current) spawning by other reef systems over quite a considerable distance and this is also true for important commercial stocks such as lobster (and some commercially important reef fish species also).	The project has been amended and expanded to include more emphasis on assessment of coastal issues, especially larval transport and the mapping of nursery areas. Also further reference has been added to habitats supporting globally significant biodiversity in the project system boundary (such as coral reefs and seamounts) and their relationship to the LMEs. In this respect the coastal waters are no longer being ignored by the UNDP Project following amendments. The UNEP sister project will be dealing with land-based sources of pollution. The Project will also be working closely with the IOC Project on a 'Regional Programme for the Sustainable Management of the Coastal Zones of the Countries in the Indian Ocean', which will provide significant additional information on coastal issues to inform the TDA process. Other information exists within past and on-going coastal projects which will be captured during the assessment process	Additional text added to section on <b>Marine and Coastal Biodiversity</b> in relation to coral reefs and seamounts. See also <b>Outcome 1</b> with additional text on mapping of nursery areas and on larval transport (including commercial species and major ecosystem-function species such as coral reefs)
It is not immediately clear from the project document on whether it is envisioned that there may be other gaps in knowledge that may become apparent as the project proceeds. It might be wise to include a contingency element in the project to account for this, both in allocation of ship time and personnel and an element of the budget.	Additional budget has been identified as a contingency to cover unexpected 'gaps' that need to be addressed. A contingency element will also be included in the Planning and Strategy for the Oceanographic Surveys	See <b>Annex 9 - Planning and Strategy for the Oceanographic Surveys</b>
There is almost certainly considerable relevant data that resides outside of the region as a result of earlier scientific work by international groups and bodies. This needs to be identified and made available and accessible to the region through whatever mechanisms the project adopts as an information 'clearing house'.	Repatriation of appropriate data is a high priority within the project and is reflected under the outputs and activities of Outcome 2. Such data would be stored within a clearing house for access by the countries and the project	No amendment required
The issue of what will be done to process, report and archive the vast quantities of data once it has been collected needs to be addressed. It is imperative that this data remains accessible to the countries and scientists of the region and the project should define some sort of mechanisms for developing an information 'clearing house', possibly attached to an existing regional agency with the skills or capacity to handle said mechanism.	The project document now makes direct reference to a clearing house mechanism and the need to define (within the early stages of the project) where such a clearing house should be institutionalized.	See <b>Outcome 2 - Output 2.1</b>

STAP COMMENT	RESPONSE TO COMMENT	REFERENCE TO PRODOC
<p>Outcome 2 is that “Decision making tools are in place to facilitate the synthesis and application of data for LME management”. This is to be achieved through the creation of a data management facility, the definition of a set of indicators and by the development of a GIS capability for spatial mapping. The document is vague on the methodology for achieving these outcomes. (Furthermore) the document would benefit from an explanation of how data and monitoring results would flow into management/operationalization, and into Governance/policy.</p>	<p>The document has been amended to provide better explanation of how data would be synthesized and applied to management processes in such a way that there would be an appropriate flow of results into the operationalization process and up to the policy level. Furthermore, Project linkages to IW:LEARN will provide access to fora for global linkages, while NEPAD will provide a forum for linkages within Africa, through its Coordinating Unit for Coastal and Marine Programmes, based in Nairobi. The Coordinator of this Unit will sit on the PSC.</p>	<p>See Revised <b>Outcome 2</b>.</p>
<p>The linkages with other GEF supported LME projects (particularly at a global level) may prove to be an expensive and time consuming business. More use of a web-based “virtual” forum should be considered, and the Project Document should identify a regional agency that would have responsibility for coordination of African LME initiatives, lessons and best practices.</p>	<p>A web-based forum would indeed be a central part of the 'linkage' and 'coordination' process. Identification of a regional agency (e.g. NEPAD) for coordinating African LME initiatives is already underway and it is hoped that this will have been agreed by the time that this project enters its inception stage, if not before.</p>	<p>See <b>Outcome 3 - Output 3.4</b> for additional text clarifying this development</p>
<p>The text identifies that DLIST would provide a mechanism of community outreach and to build community support. However, it is not clear how such a Tool (which, on the surface at least, seems to be fairly advanced) would make this outreach or build this support at the grass-roots level.</p>	<p>A clearer explanation of the purpose and function of DLIST and how it achieves community outreach has now been added to the document</p>	<p>See additional text and website link now added to <b>Outcome 4 - Output 4.2</b></p>
<p>There is very little mention anywhere in the Project Document about private sector participation, which will be vital for long-term sustainability. A Partnership Conference might be a valuable tool for promoting cooperation and trust and to develop ideas for mutual work and co-funding (always with a view to the Implementation Phase later).</p>	<p>An initial Partnership Conference has now been scheduled for the later stages of this project once the assessment has been completed and TDA processes are underway. This would be appropriate timing as there would be a clearer understanding then of what GEF can achieve in the ASCLMEs region in relation to LMEs and what sort of timescale might be appropriate. True private sector involvement and partnership evolution will come into its own during the following (SAP Implementation) phases of the GEF initiative and assistance</p>	<p>See additional text in <b>Outcome 4 - Output 4.2</b></p>
<p>Table 8 (Para. 52 - linkages to related GEF projects), would be better as an Annex, with primary links mentioned in the text and referring the reader to the Annex. This is an example of the unnecessarily heavy use of tables within the text, which attempt to abbreviate and clarify, but actually compress and repeat too much information within one place, and end up detracting from the flow of the document.</p>	<p>Table 8 has been moved to the annexes and expanded somewhat to include other non-GEF activities in the region. Where appropriate, other tables have been annexed with reference to them from the main text</p>	<p>Text amended (see <b>Linkages with GEF Financed Projects</b>) and relevant information annexed as appropriate</p>

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## **ANNEX 13: COUNCIL COMMENT AND RESPONSES TO COUNCIL COMMENTS**

### ***Responses to Comments from Switzerland***

#### ***Comment 1***

The Council member from Switzerland stated that, without having seen detailed ToR for the Project Coordination Unit (PCU), it is not evident whether the PCU role is confined to the present ASCLMEs project, or whether its coordinating efforts are to be extended to the other two projects (No. 16, and in particular WIO-LaB). This aspect is also to be seen in the light of its role with regard to the Project Steering Committee (PSC) and Project Coordination Committee (PCC).

#### ***Response 1***

The Project Coordination Unit (PCU) of the ASCLMEs Project will have a Project Manager, Deputy Project Manager, who will also serve as Chief Scientist, an Administrative Assistant, Financial Officer, a TDAs/SAPs Development Specialist, Communications Director, and requisite secretarial personnel. A detailed Terms of Reference for all staff appears as Annex 17 of this Project Document. Two members of the PCU are to be considered ASCLMEs Programme staff, meaning that they will have over-arching responsibilities on behalf of the three Projects within the Programme. Responsibilities for these Programme personnel have been discussed with and agreed to by the WIO-LaB and SWIOFP Projects. Further, each of the two other Projects within the ASCLMEs Programme, the WIO-LaB and the SWIOFP, will be represented on the ASCLMEs Project Steering Committee, and vice-versa. This should assure necessary policy level integration of the Projects within the Programme. Last, several members of the ASCLMEs Project Steering Committee are also members of the WIO-LaB and SWIOFP Steering Committees, and this creates strengthened and effective inter-project communication

#### ***Comment 2***

It was further observed by the Council Member from Switzerland that coordinated activities and joint actions between the projects (e.g. joint survey work, joint preparation of the Trans-boundary Diagnostic Analysis (TDA) and Strategic Action Plan (SAP), coordinated education activities etc.) are being contemplated. The idea is to eliminate duplication and to maximize synergies between the projects. This is highly desirable, but it warrants special efforts and an organizational set-up which is able to deal with such an intricate coordination. The present organizational scheme is not explained lucidly enough, nor does it seem to cater for the complexity of the coordination task at hand.

#### ***Response 2***

The three Projects within the Programme have jointly developed a Programme Coordination Plan (Plan) which appears in this Project Document as Annex 16. The Plan explains the respective roles of Project and Programme personnel to ensure a level of coordination that will minimize duplication of effort and create synergies and cost efficiencies across the three Projects and to the benefit of the participating countries.

#### ***Comment 3***

The Swiss Council Member observed that dealing with one LME at a time provides a challenge on its own. Tackling two LMEs simultaneously, whereby the links still have not yet been clearly illustrated, is new ground. A step-by-step approach is recommended, whereby any follow-up step is based on the experience gained from the previous step.

#### ***Response 3***



The UNDP-GEF agrees with a step-by-step approach as recommended by the Swiss Council Member, and for the same reasons. Accordingly, Project specific monitoring and evaluation procedures that have been developed subsequent to Council review of the project, takes into account the need for a step-by-step approach as recommended. The Project specific Monitoring and Evaluation Plan is listed as Annex 14 of the Project Document.

***Comment 4***

The Swiss Council member observes that a Project Steering Committee (PSC) is to be created under the auspices of the United Nations Office of Project Services (UNOPS). Further it was stated that “One representative for each of the (three) related projects will be included. The PCS is to meet annually. In addition, a Program Coordination Committee (PCC) will be created, comprised of members from each of the (three) projects. This is seen as commendable, but the main concern is that the major emphasis is thereby placed on the scientifically-oriented present project [intercessional review No. 15], at the cost of the other related projects. It seems that SWIOFP [intercessional review No. 16] would be more destined for overall coordination.”

***Response 4***

While there is a science emphasis in the ASCLMEs Project, there are other important emphases as well. From the very beginning of project development, and from the beginning of ASCLMEs Programme formulation, the ASCLMEs Project was seen as the “glue” necessary to bring a coherent and organized programme structure to the three projects that comprise the Programme. The UNDP-GEF ASCLMEs Project has established priorities in all reaches of the ASCLMEs ecosystems. It is for this reason that principal responsibility for development of two TDAs and two SAPs is given to the ASCLMEs Project. The SWIOFP Project will input very valuable fisheries based information into the TDAs and SAPs, but the SWIOFP Project is primarily oriented to the so-called “blue water fishery” of the two LMEs and has little emphasis on near-shore, artisanal fisheries, a critical issue in these two LMEs, and no emphasis on pollution from land based sources. Thus the UNDP-GEF ASCLMEs Project was seen as the logical choice for coordinating TDA, SAP, and other inputs at Programme level. It should also be noted that while the UNOPS is a member of the PSC, policy level decisions are arrived at by the full Steering Committee, subject to approval by the Implementing Agency.

***Comment 5***

It was pointed out that the present project emphasis is on scientific matters, monitored by a Project Science Review Panel (PSRP) as well as a Cruise Coordinating Group (CCG). Our main concern in that regard is that, with due respect to the scientific priorities, other project aspects may be neglected.

***Response 5***

One of the Project’s emphases is on scientific matters, but, as stated above, there are more and very important emphases as well. For example, perhaps the most important product of the ASCLMEs Project and the Programme as a whole will be the two TDAs and SAPs, one TDA and SAP for the ALME, and one TDA and SAP for the southern portion of the SLME. The SLME will be expanded to include areas abutting Somalia when security in that part of the SLME allows Project and Programme personnel to operate. It is true that the PSRP and CCG are heavily oriented to the science of the Project and the Programme, a necessary and important element. It is also true that other Project and Programme elements, those for example related to socio-economics and governance, must and will receive due consideration. This will be one of the responsibilities of the ASCLMEs Project Steering Committee and the Programme Coordination Committee, which is the key group responsible for assuring tight coordination among the Projects of the Programme as well as creation of synergies between the Programme and the ACEP. Both

the PSC and PCC will be comprised of senior level managers and have responsibilities commensurate with the assurance that matters other than science are fully considered during Project and Programme implementation.

***Comment 6***

The Swiss Council Member noted that in Annex C.2, Response to STAP Reviews, p.32 it is stated that....."The Project does not adequately describe the precise mechanisms of TDA-SAP preparation among the (three) interrelated GEF WIO projects. More clarity is required on how this project integrates with the UNEP (WIO-LaB) and WB components". The response to the comment is that this has been taken care of under Outcome 3, Output and Activity 3.5. We argue that this alone is not sufficient. One could expect, already at this stage, a general outline (e.g. table of contents, major issues at stake) of the expected TDA and SAP respectively, as well as relevant comments on where the collected data would be utilized. This would greatly enhance confidence in the Program Management's grasp of the inherent basic key problems.

***Response 6***

The ASCLMEs region, as incorporated into the broader Western Indian Ocean, were the subject of a preliminary TDA and quite limited SAP exercise which did produce a general outline as suggested by the comment from Switzerland. While the initial UNEP produced TDA was summarized in the text of both the ASCLMEs and the SWIOFP Project Documents, it is clear from this comment that more detail is needed. Accordingly, a summary of the principal transboundary issues that were identified as part of the preliminary, UNEP driven TDA exercise is included in the Project Document as Annex 18.

***Comment 7***

The Swiss Council member states that "It is observed that the project organizational structure needs to be explained more lucidly – it is not clear for an outside reviewer – and in particular coordination matters between projects should be given more emphasis."

***Response 7***

As previously mentioned, the Projects within the Programme have jointly created a Coordination Plan which is attached to this Project Document as Annex 16. Also, there are now explicit Terms of Reference for all Project personnel, as well as for those who will serve a Programme function, and those are to be found in the Project Document as Annex 17.

***Comment 8***

The Council Member from Switzerland noted that political uncertainties and complexities have been put forward by one or the other previous reviewer. One may argue that a long-term project will face such inherent problems for a long time yet to come, and that precautionary measures can be contemplated to minimize the associated risks.

***Response 8***

The greatest political uncertainty exists in the northern reach of the SLME, where conditions in Somalia do not at present make possible Project and Programme work. Political uncertainty in the remainder of the region is one related more to the potential for generation of political will to sustain Project and Programme objectives beyond the life of the GEF intervention. This has been mitigated to some degree by the direct involvement of the NEPAD, the Nairobi Convention and the SADC which, given the high level of political representation in each, will assist in creation for the Project and Programme the political will, at country and regional level, necessary to successful SAP implementation.

***Comment 9***

It was pointed out that the project has to be viewed on a long-term basis. Five years are a good start, but follow-up projects are bound to result. It might be wise to consider building up local expertise and capacity not only in each of the participating countries, but by focusing on a “Regional Center of Competence” (RCC) somewhere in the region. Much could be gained from this, such as genuine local interest and participation, continuity, improved sustainability and a pool of new ideas.

***Response 9***

We agree with the Member from Switzerland that the Project and the Programme must be seen in a longer term context than just the five years that are initially described in this Project proposal. The development of the two TDAs and SAPs will help establish an agenda for a much longer sequence of activities connected to the purpose and objectives of the Project and Programme, and full implementation of the SAPs is likely to take decades to fully implement. In relation to capacity building, the Projects within the ASCLMEs Programme, in cooperation with the Africa Coelacanth Ecosystem Programme (ACEP) will, immediately upon implementation, be developing a Capacity Building Plan, and one element within the Plan will be to assist the countries in identifying the elements of sustainability for regional training (capacity building) during and after the life of the GEF supported Projects. The possibility of a Regional Center of Competence will be one of the options considered.

***Responses to Comments from Germany***

***General Comment***

The German Council member stated that the proposal could be tightened and better structured.

***Response to General Comment***

The proposal has received a further edit, and the structure of the proposal has been reviewed to assure it has been written consistent with GEF and Implementing Agency guidelines and requirements.

***Specific Comment 1***

Germany believes the project should try to link with corresponding regional bi-lateral projects, and should undertake measures to assure that other regional LME projects link to synergize and minimize overlapping activities, maybe through a regional agency that coordinates LME initiatives.

***Response to Specific Comment 1***

During preparation the Project undertook an assessment of corresponding regional projects specifically to establish linkages with them as a means of avoiding duplication and creating synergies to maximize efficiencies. This assessment of corresponding regional projects will be continued during project implementation. We agree that strong coordination among LME projects in Sub-Saharan Africa, and globally should be a feature of the ASCLMEs Project and Programme. To assure this is the case, a specific, funded Activity/Outcome has been included in Project design. Activity/Outcome 3.4 will facilitate exchanges of country personnel involved in the project with other GEF IW projects in Sub-Saharan Africa and in other regions will be undertaken to assure the cross fertilization of good practices. The project will also facilitate the attendance of key project and other expert resources from the region to such events as the biennial IW conferences and other workshops as a means of building their capacities. Negotiations are currently underway to confirm the role of NEPAD as the coordination focal point for African LMEs. Once confirmed it is expected that a suitable website will be developed at Programme

level and made accessible to all African LME stakeholders (and indeed all LME stakeholders globally). A representative of the NEPAD is on the Project Steering Committee, and discussions are ongoing to determine the more precise roles that the NEPAD can assume during Project implementation.

***Specific Comment 2***

Germany observes that care should be taken to involve stakeholders who have limited or no access to technological tools such as internet or television.

***Response to Specific Comment 2***

We agree that care should be taken to involve the many stakeholders that do not have internet or television access. The project will assure broad stakeholder involvement through rigorous, ongoing work of identification of stakeholders affected by and/or with an interest in the activities and outputs of the project. Annex 1 of this Plan, prepared during appraisal, contains a list of such stakeholders. It is estimated that the project will hold approximately 160 workshops and meetings at country and regional level. Broad stakeholder involvement is crucial to the success of the TDA/SAP development process at project and programme level. Over 60 country-based and regional level meetings workshops are foreseen as necessary to assure stakeholder involvement consistent with principles outlined earlier. Stakeholder participation activities will be closely coordinated with activities undertaken by DLIST ASCLMEs.

The project will also organize and host a Partnership Symposium in the second half of the project lifecycle. The purpose of this Symposium will be to highlight the achievements of all 3 sister projects under the Programme umbrella for the ASCLMEs, to identify next steps in relation to operationalizing the SAPs, developing management approaches, and continuing to monitor selected indicators and parameters necessary to sustainably guide ecosystem-based management and policy in the region. This Symposium will also help to develop the necessary working relationships with and between public and private sector partners and NGOs which will be crucial to the implementation of the SAP.

The project, working within ongoing ACEP efforts at country and regional level, will also assist in the development of marine environmental education stakeholders who, working together in a decentralized fashion to promote environmental processes in all focal countries, will develop materials for and engage educational resources in the region to further the objectives of the projects within the programme.

Environmental Education and Learner Programmes will:

- Support meaningful involvement of EE practitioners in the region;
- Create a wide range of networking opportunities that enable practitioners from diverse situations to contribute to and benefit from the programme;
- Assure that all participants are recognized as valuable networking partners;
- Be open ended networks that are encouraged to build on existing networks without subsuming them; and
- Assure transparency and accountability in the development and operation of a networking process in the region.

A more detailed description of the broad array of stakeholder involvement activities that will be undertaken during project and programme is to be found in Annex 15 of the Project Document, the Project's Public Participation Plan.

***Specific Comment 3***

The German Council member observes that measures must be taken to assure that project benefits are sustained once the project is completed.

***Response to Specific Comment 3***

The project will ensure that foundational capacity is in place and data gaps that hitherto have hampered development of ecosystem-based approaches to management of the LMEs will be addressed. This will improve fundamentals for ensuring the sustainability of interventions during the SAP implementation phase. A number of measures are planned during this phase, to set the grounds for ensuring the long-term institutional, political and financial sustainability of interventions during SAP implementation. The emphasis on foundational capacity building is well captured in funded Activities/Outputs, and will be undertaken in concert with ongoing capacity building initiatives of the ACEP and through the creation of strong linkages with the Nairobi Convention, the NEPAD, the Southwest Indian Ocean Fisheries Commission, and through collaboration with many related bi-lateral initiatives in the ASCLMEs region. The development of the two TDAs and SAPs will help establish an agenda for a much longer sequence of activities connected to the purpose and objectives of the Project and Programme, and thus also further efforts to ensure long term project and programme sustainability. As capacity building is seen as an essential element to long term sustainability the Projects within the ASCLMEs Programme, in cooperation with the Africa Coelacanth Ecosystem Programme (ACEP) will, immediately upon implementation, be developing a Capacity Building Plan, and one element within the Plan will be to assist the countries in identifying the elements of sustainability for regional training (capacity building) during and after the life of the GEF supported Projects. The possibility of a Regional Center of Competence will be one of the options considered.

## ANNEX 14: MONITORING AND EVALUATION PLAN

### M&E PLAN AND BUDGET

Project monitoring and evaluation will be conducted in accordance with established UNDP and GEF procedures. M&E will be provided by the project team and the UNDP Country Office (UNDP-CO) with support from UNDP/GEF (see Section 1 below), or by Independent Evaluators in the case of the Mid-Term and Terminal Evaluations (see Section 2 below). The Logical Framework Matrix in the main Project Document text provides *performance* and *impact* indicators for project implementation along with their corresponding *means of verification*. The Workplan and Budget (also in the main Project document text) provide delivery and disbursement targets. These elements form the basis on which the project's Monitoring and Evaluation system will function.

The following sections outline the principle components of the Monitoring and Evaluation Plan and indicative cost estimates related to M&E activities. The project's Monitoring and Evaluation Plan will be presented, reviewed and endorsed at the Project's Inception Report following any appropriate collective fine-tuning of indicators, means of verification, and an explanation and full definition of project staff M&E responsibilities.

Table 11 in the main text of the Project Document under Monitoring and Evaluation provides details of scheduling and frequency for all M&E requirements.

#### 1. MONITORING AND REPORTING

##### 1.1. Project Inception Phase

A Project Inception Workshop will be conducted with the full project team, relevant government counterparts and National Focal Points, co-financing partners, the UNDP-CO and representation from the UNDP-GEF Regional Coordinating Unit, as well as UNDP-GEF (HQs) as appropriate.

A fundamental objective of this Inception Workshop will be to assist the project team to understand and take ownership of the project's goals and objectives, as well as finalize preparation of the project's first annual work plan on the basis of the project's logframe matrix. This will include reviewing the logframe (indicators, means of verification, assumptions), imparting additional detail as needed, and on the basis of this exercise finalize the Annual Work Plan (AWP) with precise and measurable performance indicators, and in a manner consistent with the expected outcomes for the project.

Additionally, the purpose and objective of the Inception Workshop (IW) will be to: (i) introduce project staff to the UNDP-GEF *expanded team* which will support the project during its implementation, namely the CO and responsible Regional Coordinating Unit staff; (ii) detail the roles, support services and complementary responsibilities of UNDP-CO and RCU staff vis-à-vis the project team; (iii) provide a detailed overview of UNDP-GEF reporting and monitoring and evaluation (M&E) requirements, with particular emphasis on the Annual Project Implementation Reviews (PIRs) and related documentation, the Annual Project Report (APR), Tripartite Review Meetings, as well as mid-term and final evaluations. Equally, the IW will provide an opportunity to inform the project team on UNDP project related budgetary planning, budget reviews, and mandatory budget re-phasing.

The IW will also provide an opportunity for all parties to understand their roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff and decision-making structures will be discussed again, as needed, in order to clarify for all, each party's responsibilities during the project's implementation phase.

## 1.2. Monitoring Responsibilities and Events

Table 13.1 (below) presents a Schedule of M&E-related meetings and reports along with their associated budgeting. These will be reviewed by the project management, the project implementation partners and stakeholder representatives and, after endorsement, incorporated in the Project Inception Report.

- *Day to day monitoring of implementation progress* will be the responsibility of the Project Coordinator based on the Project's Annual Work Plan and its indicators. The Project Team will inform the UNDP-CO of any delays or difficulties faced during implementation so that the appropriate support or corrective measures can be adopted in a timely and remedial fashion.

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- The Project Coordinator will fine-tune the progress and performance/impact indicators of the project in consultation with the full project team at the Inception Workshop with support from UNDP-CO and assisted by the UNDP-GEF Regional Coordinating Unit.. Specific targets for the first year implementation progress indicators together with their means of verification will be developed at this Workshop. These will be used to assess whether implementation is proceeding at the intended pace and in the right direction and will form part of the Annual Work Plan. The local implementing agencies will also take part in the Inception Workshop in which a common vision of overall project goals will be established. Targets and indicators for subsequent years would be defined annually as part of the internal evaluation and planning processes undertaken by the Project Team, and agreed with the Executing and Implementing Agencies.

- Measurement of impact indicators related to global benefits will occur according to the schedules defined in the Inception Workshop and tentatively outlined in the indicative Impact Measurement Template (Table 13.2 below). The measurement, of these will be undertaken through subcontracts or retainers with relevant institutions (e.g. water quality data to demonstrate trends, or fisheries catch data and inventories to show changes in populations of target species) or through specific studies that are to form part of the projects activities (e.g. information on larval transport, spawning areas and nursery areas from specific cruises).

*Periodic monitoring of implementation progress* will be undertaken by the UNDP-CO through the provision of quarterly reports from the Project Team, Furthermore, specific meetings can be scheduled between the Project Team, the UNDP CO and other pertinent stakeholders as deemed appropriate and relevant (e.g. Steering Committee members, Focal Points, Co-funding partners, etc) Such meetings will allow parties to take stock and to troubleshoot any problems pertaining to the project in a timely fashion to ensure smooth implementation of project activities. A Mission Report will be prepared by the Project Team in coordination with the UNDP CO, and circulated (no less than one month after the Mission) to the Project Team, all SC members, UNDP-GEF and any accompanying stakeholders.

*Annual Monitoring* will occur through the **Tripartite Review (TPR)**. This is the highest policy-level meeting of the parties directly involved in the implementation of a project. Its name refers to the fact that the Review is effectively undertaken by three primary stakeholders i. The Countries, ii. The Implementing Agencies, and iii, the Executing Agency. In reality, TPRs today involve all

stakeholders and the primary review body is effectively the Project Steering Committee. The project will be subject to Tripartite Review (TPR) at least once every year. The first such meeting will be held within the first twelve months following the Inception Workshop. The project proponent will prepare an Annual Project Report (APR) and submit it to UNDP-CO and the UNDP-GEF regional office at least two weeks prior to the TPR for review and comments.

The APR will be used as one of the basic documents for discussions in the TPR meeting. The Project Coordinator and Team will present the APR to the TPR, highlighting policy issues and recommendations for the decision of the TPR participants. The Project Coordinator and Team also inform the participants of any agreement reached by stakeholders during the APR preparation on how to resolve operational issues. Separate reviews of each project component may also be conducted if necessary. Details regarding the requirements and conduct of the APR and TPR are contained with the M&E Information Kit available through UNDP GEF.

### **Terminal Tripartite Review (TTR)**

The terminal tripartite review is held in the last month of project operations. The Project Coordinator is responsible for preparing the Terminal Report and submitting it to the relevant UNDP-COs and GEF's Regional Coordinating Unit. It shall be prepared in draft at least two months in advance of the TTR in order to allow review, and will serve as the basis for discussions in the TTR. The terminal tripartite review considers the implementation of the project as a whole, paying particular attention to whether the project has achieved its stated objectives and contributed to the broader environmental objective. It decides whether any actions are still necessary, particularly in relation to sustainability of project results, and acts as a vehicle through which lessons learnt can be captured to feed into other projects under implementation of formulation. The TTR should refer to the Independent Terminal Evaluation report, conclusions and recommendations (see below) as appropriate.

The TPR has the authority to suspend disbursement if project performance benchmarks are not met as per delivery rates, and qualitative assessments of achievements of outputs. Benchmarks are effectively represented by the indicators in the Logical Framework. These will be more clearly defined (as measurable delivery per annum) and endorsed at the Inception Workshop.

### **1.3. Project Monitoring Reporting**

The Project Coordinator in conjunction with the UNDP-GEF extended team will be responsible for the preparation and submission of the following reports that form part of the monitoring process. Items (a) through (e) are mandatory and strictly related to monitoring, while (f) and (g) have a broader function and the frequency and nature is project-specific, to be defined throughout implementation.

#### **(a) Inception Report (IR)**

A Project Inception Report will be prepared immediately following the Inception Workshop. It will include a detailed First Year Work Plan divided in quarterly time-frames detailing the activities and progress indicators that will guide implementation during the first year of the project. This Work Plan will include the proposed dates for any visits and/or support missions from the UNDP-CO or the Regional Coordinating Unit (RCU) or consultants, as well as time-frames for meetings of the Project's decision making structures. The Report will also include the detailed project budget for the first full year of implementation, prepared on the basis of the Annual Work Plan, and including any monitoring and evaluation requirements to effectively



measure project performance during the targeted 12 months time-frame (e.g. benchmarks – see **Terminal Tripartite Review** above).

The Inception Report will include a more detailed narrative on the institutional roles, responsibilities, coordinating actions and feedback mechanisms of project related partners. In addition, a section will be included on progress to date on project establishment and start-up activities and an update of any changed external conditions that may effect project implementation, including and unforeseen or newly arisen constraints.

When finalized, the report will be circulated to project counterparts who will be given a period of one calendar month in which to respond with comments or queries. Prior to this circulation of the IR, the UNDP Country Office and UNDP-GEF's Regional Coordinating Unit will review the document.

#### **(b) Annual Project Report (APR) and Project Implementation Review (PIR)**

The APR is a UNDP requirement and part of UNDP's Country Office central oversight, monitoring and project management. It is a self-assessment report by project management to the Country Office and provides CO input to the reporting process and the ROAR (Results Oriented Annual Report), as well as forming a key input to the Tripartite Project Review. The PIR is an annual monitoring process mandated by the GEF. It has become an essential management and monitoring tool for project managers and offers the main vehicle for extracting lessons from ongoing projects. These two reporting requirements are so similar in input, purpose and timing that they have now been amalgamated into a single Report.

An APR/PIR is prepared on an annual basis following the first 12 months of project implementation and prior to the Tripartite Project Review. The purpose of the APR/PIR is to reflect progress achieved in meeting the project's Annual Work Plan and assess performance of the project in contributing to intended outcomes through outputs and partnership work. The APR/PIR is discussed in the TPR so that the resultant report represents a document that has been agreed upon by all of the primary stakeholders.

A standard format/template for the APR/PIR is provided by UNDP GEF. This includes the following:

- An analysis of project performance over the reporting period, including outputs produced and, where possible, information on the status of the outcome
- The constraints experienced in the progress towards results and the reasons for these
- The three (at most) major constraints to achievement of results
- Annual Work Plans and related expenditure reports
- Lessons learned
- Clear recommendations for future orientation in addressing key problems in lack of progress

The UNDP/GEF M&E Unit analyze the individual APR/PIRs by focal area, theme and region for common issues/results and lessons. The Reports are also valuable for the Independent Evaluators who can utilise them to identify any changes in project structure, indicators, workplan, etc. and view a past history of delivery and assessment.

#### **(c) Quarterly Progress Reports**

Short reports outlining main updates in project progress will be provided quarterly to the local UNDP Country Office and the UNDP-GEF regional office by the project team. See format attached.

**(d) Periodic Thematic Reports**

As and when called for by UNDP, UNDP-GEF or the Implementing Partner, the project team will prepare Specific Thematic Reports, focusing on specific issues or areas of activity. The request for a Thematic Report will be provided to the project team in written form by UNDP and will clearly state the issue or activities that need to be reported on. These reports can be used as a form of lessons learnt exercise, specific oversight in key areas, or as troubleshooting exercises to evaluate and overcome obstacles and difficulties encountered. UNDP is requested to minimize its requests for Thematic Reports, and when such are necessary will allow reasonable timeframes for their preparation by the project team.

**(e) Project Terminal Report**

During the last three months of the project the project team will prepare the Project Terminal Report. This comprehensive report will summarize all activities, achievements and outputs of the Project, lessons learnt, objectives met, or not achieved, structures and systems implemented, etc. and will be the definitive statement of the Project's activities during its lifetime. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the Project's activities.

**(f) Technical Reports (project specific- optional)**

Technical Reports are detailed documents covering specific areas of analysis or scientific specializations within the overall project. As part of the Inception Report, the project team will prepare a draft Reports List, detailing the technical reports that are expected to be prepared on key areas of activity during the course of the Project, and tentative due dates. Where necessary this Reports List will be revised and updated, and included in subsequent APRs. Technical Reports may also be prepared by external consultants and should be comprehensive, specialized analyzes of clearly defined areas of research within the framework of the project and its sites. These technical reports will represent, as appropriate, the project's substantive contribution to specific areas, and will be used in efforts to disseminate relevant information and best practices at local, national and international levels.

**(g) Project Publications (project specific- optional)**

Project Publications will form a key method of crystallizing and disseminating the results and achievements of the Project. These publications may be scientific or informational texts on the activities and achievements of the Project, in the form of journal articles, multimedia publications, etc. These publications can be based on Technical Reports, depending upon the relevance, scientific worth, etc. of these Reports, or may be summaries or compilations of a series of Technical Reports and other research. The project team will determine if any of the Technical Reports merit formal publication, and will also (in consultation with UNDP, the government and other relevant stakeholder groups) plan and produce these Publications in a consistent and recognizable format. Project resources will need to be defined and allocated for these activities as appropriate and in a manner commensurate with the project's budget.

**2. INDEPENDENT EVALUATION**

The project will be subjected to at least two independent external evaluations as follows:

**(i) *Mid-term Evaluation***

An independent Mid-Term Evaluation will be undertaken at the end of the second year of implementation. The Mid-Term Evaluation will determine progress being made towards the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-term evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

**(ii) *Final Evaluation***

An independent Final Evaluation will take place three months prior to the terminal tripartite review meeting, and will focus on the same issues as the mid-term evaluation. The final evaluation will also look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental goals. The Final Evaluation should also provide recommendations for follow-up activities. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

**Audit Clause**

The Government will provide the Resident Representative with certified periodic financial statements, and with an annual audit of the financial statements relating to the status of UNDP (including GEF) funds according to the established procedures set out in the Programming and Finance manuals. The Audit will be conducted by the legally recognized auditor of the Government, or by a commercial auditor engaged by the Government.

**3. LEARNING AND KNOWLEDGE SHARING**

Results from the project will be disseminated within and beyond the project intervention zone through a number of existing information sharing networks and forums (with specific consideration being given to DLIST as a Project internal mechanism and IW:LEARN as a more global mechanism). In addition:

- ◆ The project will participate, as relevant and appropriate, in UNDP/GEF sponsored networks, organized for Senior Personnel working on projects that share common characteristics. UNDP/GEF shall establish a number of networks, such as Integrated Ecosystem Management, eco-tourism, co-management, etc, that will largely function on the basis of an electronic platform.
- ◆ The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons learned.

The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects. Identify and analyzing lessons learned is an on-going process, and the need to communicate such lessons as one of the project's central contributions is a requirement to be delivered not less frequently than once every 12 months. UNDP/GEF shall provide a format and assist the project team in categorizing, documenting and reporting on lessons learned. To this end a percentage of project resources will need to be allocated for these activities.

**TABLE H-1: INDICATIVE MONITORING AND EVALUATION WORK PLAN AND CORRESPONDING BUDGET**

<b>Type of M&amp;E activity</b>	<b>Responsible Parties</b>	<b>Budget US\$</b> <i>Excluding project team Staff time</i>	<b>Time frame</b>
Inception Workshop	<ul style="list-style-type: none"> <li>▪ Project Coordinator</li> <li>▪ UNDP CO</li> <li>▪ UNDP GEF</li> </ul>	20,000	Within first two months of project start up
Inception Report	<ul style="list-style-type: none"> <li>▪ Project Team</li> <li>▪ UNDP CO</li> </ul>	None	Immediately following IW
Measurement of Means of Verification for Project Purpose Indicators	<ul style="list-style-type: none"> <li>▪ Project Coordinator will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members</li> </ul>	To be finalized in Inception Phase and Workshop. Indicative cost 24,000	Start, mid and end of project
Measurement of Means of Verification for Project Progress and Performance (measured on an annual basis)	<ul style="list-style-type: none"> <li>▪ Oversight by Project GEF Technical Advisor and Project Coordinator</li> <li>▪ Measurements by regional field officers and local IAs</li> </ul>	To be determined as part of the Annual Work Plan's preparation. Indicative cost 5,000 PA = 25,000	Annually prior to APR/PIR and to the definition of annual work plans
APR and PIR	<ul style="list-style-type: none"> <li>▪ Project Team</li> <li>▪ UNDP-CO</li> <li>▪ UNDP-GEF</li> </ul>	None	Annually
TPR and TPR report	<ul style="list-style-type: none"> <li>▪ Government Counterparts</li> <li>▪ UNDP CO</li> <li>▪ Project team</li> <li>▪ UNDP-GEF Regional Coordinating Unit</li> </ul>	None	Every year, upon receipt of APR
Steering Committee Meetings	<ul style="list-style-type: none"> <li>▪ Project Coordinator</li> <li>▪ UNDP CO</li> </ul>	None	Following Project IW and subsequently at least once a year
Periodic status reports	<ul style="list-style-type: none"> <li>▪ Project team</li> </ul>	5,000	To be determined by Project team and UNDP CO
Technical reports	<ul style="list-style-type: none"> <li>▪ Project team</li> <li>▪ Hired consultants as needed</li> </ul>	15,000	To be determined by Project Team and UNDP-CO
Mid-term External Evaluation	<ul style="list-style-type: none"> <li>▪ Project team</li> <li>▪ UNDP- CO</li> <li>▪ UNDP-GEF Regional Coordinating Unit</li> <li>▪ External Consultants (i.e. evaluation team)</li> </ul>	35,000	At the mid-point of project implementation.
Final External	<ul style="list-style-type: none"> <li>▪ Project team,</li> </ul>	50,000	At the end of project

Evaluation	<ul style="list-style-type: none"> <li>▪ UNDP-CO</li> <li>▪ UNDP-GEF Regional Coordinating Unit</li> <li>▪ External Consultants (i.e. evaluation team)</li> </ul>		implementation
Terminal Report	<ul style="list-style-type: none"> <li>▪ Project team</li> <li>▪ UNDP-CO</li> <li>▪ External Consultant</li> </ul>	None	At least one month before the end of the project
Lessons learned	<ul style="list-style-type: none"> <li>▪ Project team</li> <li>▪ UNDP-GEF Regional Coordinating Unit (suggested formats for documenting best practices, etc)</li> </ul>	15,000 (average 3,000 per year)	Yearly
Audit	<ul style="list-style-type: none"> <li>▪ UNDP-CO</li> <li>▪ Project team</li> </ul>	4,000 (average \$1000 per year)	Yearly
Visits to field sites (UNDP staff travel costs to be charged to IA fees)	<ul style="list-style-type: none"> <li>▪ UNDP Country Office</li> <li>▪ UNDP-GEF Regional Coordinating Unit (as appropriate)</li> <li>▪ Government representatives</li> </ul>	15,000 (average one visit per year)	Yearly
<b>TOTAL INDICATIVE COST</b> <i>Excluding project team staff time and UNDP staff and travel expenses</i>		US\$ 208,000	

## Annex H-2: IMPACT MEASUREMENT TEMPLATE

Key Impact Indicator	Target ( By Year 5)	Means of Verification	Sampling frequency	Location
Fishing Effort	Stabilization of currently over-exploited fish stocks within the LMEs. Recovery of depleted stocks within the LMEs	Catch statistics for each country. FAO Data Sampling Cruises	Annual	Throughout LME in recognized fishing zones
Commercial Target Species	Halt in decline of numbers of selected species within the LMEs e.g. Tuna, orange roughy, squid, lobster, prawn	Catch statistics for each country. FAO Data Sampling Cruises	Annual	Throughout LME in recognized fishing zones
Non-Commercial Threatened or Endangered Species	Halt in decline of populations of threatened or endangered species within the LMEs e.g. Turtles, cetaceans, dugong, coelacanths, etc.	Survey programmes. Fall in numbers as by-catch (fishery statistics)	Annual	Throughout species ranges
Anthropogenic Climate Change	Agreements in place to reduce carbon emissions and to act on global warming and sea level rise locally (within the LMEs)	Policies adopted into national legislation Independently verified reduction in carbon emissions (participating countries). Satellite data	Once – final year of project	Participating countries
Coastal Pollution	Reduction in LBS and ship-based discharges within the LME	Ground/Sea sampling and cruises. Satellite imagery	Start, mid and end of Project	Point discharges and throughout LMEs
Selected Habitats	Halt in degradation of critical coastal habitats (coral reefs, mangrove, seagrass beds, etc) Restoration of coastal habitats in selected areas	Satellite imagery & ground truthing. Knowledge of larval transport trends (esp. corals and related species) Increase in habitat in previously unrecorded or low-level areas	Start, mid and end of Project	Selected areas where habitat present
Transboundary LME Management	Shared fisheries management strategies. Coordinated ‘on-the-ground activities’ e.g. compliance, monitoring, surveillance, etc	Cooperative management strategies formally agreed. Coordinated field activities in support of management strategies	Mid and end of Project (Evaluations)	Participating Countries
National Millennium Development Goals	Reduction in national poverty and hunger. Increased national environmental sustainability. Increased development	International reports; national reports; MoU and LoA for partnerships	Annual	<b>Participating Countries</b>

Key Impact Indicator	Target ( By Year 5)	Means of Verification	Sampling frequency	Location
	partnerships at national level			

N.B. Indicative figures for targets to be discussed and adopted where appropriate at the Inception Workshop

## ANNEX 15: PUBLIC PARTICIPATION PLAN

### Background/Socioeconomics

Over one hundred and sixty million people reside in countries bordering the ASCLMEs area while the overall coastal population in the region (including the islands) is estimated at some 55 million. The region is characterized by some of the highest poverty levels in the world. This population is greatly influenced by environmental phenomena linked to the Indian Ocean. Most nations in the area place great reliance on the sea to assure food security through the harvest of living marine resources for subsistence and employment including from artisanal fisheries, transport and coastal tourism industries.

The Agulhas and Somalis Current LMEs support regionally important fisheries, with industrial fishery landings of approximately 280,000 metric tonnes per annum (FAO 2002). The main industrial fisheries include the tuna fisheries, and smaller fisheries for orange roughy, squid, lobster and prawns. The fishing industry provides a significant contribution of foreign exchange to the region. Fisheries exports of US\$943 million significantly surpassed imports of US\$227 million in 2002. Catches by vessels of non-African states represent about 25 to 30 percent of fish catch. Commercial fishing for shrimp and for pelagic species such as tuna have secondary effects in their impact on other species such as cetaceans and turtles, while processing factories and port developments have an impact on the coastal zone in terms of pollution, habitat destruction and the concentration of people. Meanwhile, data suggests fishing effort is escalating, especially by distant fishing nations operating in international waters. Inevitably this expanding fishing effort will focus on the upwellings and higher nutrient and productivity areas associated with the Agulhas and Somali Current LMEs and the Mascarene Plateau. However, most of the region's fisheries go unreported in global statistics, largely due to their unregulated and informal nature.

Fish often represent the primary source of animal protein for many local communities in the region. Nutritionally, fish are an important source of protein, especially where other sources of animal protein are scarce or expensive. This is particularly the case in the Small Island Developing States (SIDS). The share of fish to animal protein exceeds 50% in Seychelles and Comoros and is greater than 20% in all countries except Kenya, South Africa and Madagascar. Rice, maize, wheat and cassava make up the bulk of the food consumed by the people of the region. However there are essential micronutrients not found in these staples or found only in small quantities, for example iron, iodine, zinc, calcium, and vitamin A. Symptoms of these deficiencies in the region include goitre. Fish are particularly rich in these micronutrients, for example iodine, and also contribute fatty acids necessary for the development of the brain and body. The importance of fish in the diet of a population is therefore now widely recognized, especially for the diets of young children, infants and pregnant women. Further, fish harvesting, processing and marketing generates livelihoods, employment and income for approximately 2.2 million people along the coast of the ASCLMEs. Although employment cannot be taken as a firm assurance of food security, artisanal fisheries exist in coastal areas where alternative employment opportunities are scarce. The sector thus makes a key contribution to household welfare (including both subsistence and income generation).

Artisanal and subsistence fishers take a much wider range of fish and invertebrates than do industrial/commercial fisheries. This is because small-scale fishers of the region are resourceful in developing different fishing techniques to take advantage of every possible niche available for harvesting. More than 100 artisanal fishery types have been identified and described for the region which range from passive trap fishing to labor-intensive seine netting and spear fishing<sup>57</sup>. The IOTC estimate that artisanal fishermen now take as many of the 16 tuna species in the Indian Ocean as a whole as do the industrial fleets. This may serve to highlight the significance of the need for a clear definition between artisanal and subsistence fishermen. Artisanal fishing, which generally requires low financial capital inputs, often constitutes the basis of a diversified livelihood strategy for coastal

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<sup>57</sup> Western Indian Ocean Environment Outlook. 2000



communities. It can help to i) spread risks between various economic activities in an uncertain environment and therefore reduce vulnerability, ii) create a synergy with other livelihoods and enhance capital accumulation, and iii) generate cash. Fishing, even as a secondary activity is therefore important for the generation of income for coastal communities along a large swathe of the region's coastline. Most of the region's 236,000 fishers use low technology gear (harpoons, hand lines, traps, seines and nets) that take a diverse catch of fish and invertebrates, including, at times, other marine animals (e.g. turtles). One of the main social concerns relating to artisanal fisheries is the need to improve the social and economic situation of traditional fishing communities. There is considerable evidence that such communities are amongst the poorest segments of society in the region. This situation is getting worse as the number of artisanal fishermen increase as a reflection of the lack of alternatives within the local economies.

The problem of poverty has been aggravated by recent drought situations that have hit parts of the region in recent years, manifested in recurring food crises. Poverty and food security are linked concepts. People who are chronically poor usually lack access to food. Additionally, malnutrition negatively affects people's working and learning capacity, and may affect vulnerable groups living just above the poverty threshold, causing them to enter the ranks of the poor. Poverty in the region is particularly acute among vulnerable groups such as households headed by the elderly and children (that are now on the increase due to the impact of the HIV/AIDS pandemic). Fisheries workers are a group highly vulnerable to HIV/AIDS, often as a result of the migrant nature of their work. Increased understanding of the nature of the fisheries in the region, in particular near-shore fisheries will serve to enhance their management. This will ensure that fish remains an important food source for coastal communities over the long-term horizon. This is especially important on the African coastline where HIV/AIDS infection rates can be as high as 20-25% and where the compound effects of morbidity from the illness and malnutrition (i.e. from food crises) is leading to high mortality amongst vulnerable groups.

In recognition of the complexity and importance of the social and economic conditions that shape the present and will shape the future of the ASCLMEs region, it is important that the many different and diverse stakeholder groups that depend on the marine resources and/or influence their management be given opportunity to be informed by, and help inform processes intended to create a sustainable future for the people of the region and of the natural resources that are an essential pre-condition to achieve sustainability. The following public participation plan is intended to further the objective of offering to the stakeholders of the region a voice in helping shape their collective future.

### **The ASCLMEs Project and Programme Public Participation Plan**

#### *Context*

The countries themselves, regionally based organizations, and bi-lateral and multi-lateral donors support a large number of projects and programmes in the ASCLMEs, the reality, however, is that they are often unaware of each other, and thus synergies are left untapped, and coordination that could create financial and organizational efficiencies are not undertaken. Community-based groups and NGOs are also active in the region, yet seldom involved sufficiently in regionally based initiatives. The coast is densely populated and highly dependent on marine resources, yet the ultimate beneficiaries of these initiatives are often poorly informed about initiatives, how they might participate in and benefit from them, or given the opportunity to contribute their significant, on the ground experience to assist in the design and implementation of the many measures that are being undertaken.

It is generally agreed that information sharing between and among different groups of stakeholders is insufficient and not conducive to local participation in coastal development and management. There is often poor or no understanding of the values of the LMEs and sustainable uses of their resources. Pressure on marine resources also results from lack of alternative livelihoods and insufficient support to community based initiatives. It is estimated that 60 million of the 160 million people of the WIO are dependent upon natural resources provided by the sea, and poverty alleviation, food security,

sustainability, conservation and general improvement in the quality of human lives are of paramount importance to the people who depend upon the marine resources of the region. Accordingly, project and programme activities should have relevance to the socio-economic context in which it operates should be of benefit to human communities and promote the economy directly or indirectly. Achievement of such objectives requires attempts to understand the social and economic conditions in each locality. Thus community involvement, recording and use of indigenous knowledge systems are prerequisites to success. It is necessary to promote activities associated with better understanding and incorporation of these disciplines, and Activity/Output 1.4 of the ASCLMEs project, undertaking a region wide, coastal based economic valuation study, is being undertaken by the project for this purpose, and will accrue to the benefit of each of the projects within the ASCLMEs Programme.

### *Approach*

The ASCLMEs Project and Programme have been designed to assist countries institutionalize an ecosystem-based management approach to utilize and protect the ocean resources of the WIO, based on solid science and underpinned by effective environmental governance region-wide. For this to occur, the different countries, organizations, institutions, and groups that undertake research, manage and use the ocean resources need to coordinate efforts to ensure long-term protection and promote adequate knowledge sharing and management.

The ASCLMEs Project and Programme provide excellent opportunity to involve government ministries and agencies at federal and local levels, academic and research institutions, the private sector, NGOs and Community-Based Organizations (CBOs), and other stakeholders to fill knowledge gaps and engage in monitoring the ASCLMEs with a view to their long-term sustainable management through their involvement in Project and Programme activities and, ultimately, through capacity building. Science results will be disseminated in understandable language among resource users and managers, enabling translation of those results into management action. At the same time, the scientific and academic communities need to rely on localized knowledge held by fishers and other users of resources, and the Project and Programme will assist in this task during implementation.

The following Public Participation Plan (Plan) has been developed consistent with a number of assumptions of resource values of the Agulhas and Somali Current Large Marine Ecosystems (ASCLMEs), and an understanding of those values on the part of affected stakeholders in the participating countries of the Project. An over-arching objective of the three projects within the programme is increasing knowledge of the resources of the ASCLMEs. Yet there is an understanding that the accumulation of knowledge of these systems must be communicated effectively to key stakeholders as a means of creating support for government actions to sustain those resources and increase stakeholder support for the creation of governmental policies and specific measures to create elements of sustainability for the ASCLMEs. Also, there is a general lack of knowledge on the part of stakeholders for what is known about the ASCLMEs, as has been concluded during project preparation and recognized by groups such as the Africa Coelacanth Ecosystem Programme (ACEP) that have been working on marine based public participation and education activities. And yet millions of people are dependent on the resources within the WIO region, where economic development and poverty alleviation and food security are linked to marine resources and their sustainable use.

This Plan also assumes that successful public participation must emphasize two-way communication. It is important that the ASCLMEs Project and overall Programme communicate information that will be generated by the Project and Programme effectively to stakeholders. But it is also important that the Project and Programme take note of, and be able to incorporate into the Transboundary Diagnostic Analysis (TDA) and the Strategic Action Programme (SAP) the substantial amount of ASCLMEs information that can be contributed by the various stakeholders to those responsible for Project and Programme implementation and to governments. Several assumptions underlie the approach being taken as part of this Plan. They include a need to:

- understand that knowledge empowers people and that shared knowledge based on sound principles and solid information can contribute to better governance and sustainable natural resource management, thereby contributing to poverty alleviation through the empowerment of groups and individuals;
- recall that successful public participation must emphasize effective multiple pathways of communication between and among the project and programme, governments at all levels, and stakeholders;
- increase access of local communities and other stakeholders to information that is critical to environmental management and sustainable livelihood creation, founded on the target region's coastal and marine resources;
- translate the outputs from the science investigations into management action, through mass education, targeted environmental education, and awareness building among stakeholder communities;
- de-mystify the science that is an inescapable part of our attempts to sustainably manage marine ecosystems;
- assure broad stakeholder participation in Project and Programme activities and outputs, with special emphasis on TDA and SAP development; and
- assist governments through a program of not only creating but sustaining broad stakeholder support to adaptively manage these complex systems.

### *Principles*

The process of project/programme stakeholder participation will be further guided by a more specific set of “principles” which are presented in Table 1, below:

**Table 1: Stakeholder Participation Principles**

<b>Principle</b>	<b>Stakeholder participation will:</b>
Understanding of the varying social and cultural milieus of the region	Include each of the participating countries and thus capture essential indigenous knowledge for project use and for dissemination
Value-added	be an essential means of adding value to the project
Inclusiveness	include all relevant stakeholders
Accessibility	be accessible and promote access to the process
Transparency	be based on transparency and fair access to information
Fairness	ensure that all stakeholders are treated in a fair and unbiased way
Accountability	be based on a commitment to accountability to and by all stakeholders
Constructive	Seek to promote the public interest in a constructive manner
Redressing	Allow for identification of inequities and identification of potential means to address them
Capacity Building	Seek to develop the capacity of all stakeholders
Flexibility	be flexibly designed and implemented
Rational and Coordinated	be rationally planned and coordinated at project and programme level, not <i>ad hoc</i>
Excellence	be subject to ongoing reflection and

*Project Activities*

An initial stakeholder analysis was undertaken across the Project/Programme region during project preparation in order to identify key stakeholders and to assess their mandates, roles, importance and influence on the project. Annex 1 contains the information gleaned from this analysis. The analysis was undertaken with the assistance of on-the-ground human resources during project preparation, through the presence of stakeholders engaged during project preparation, through existing ACEP activities through out the region, and through research on the internet. Project preparation entailed consultation with stakeholder groups through use of workshops and direct contact. The objectives of the overall analysis were to:

- (i) identify key stakeholders with respect to Project and Programme objectives and activities/outputs;
- (ii) identify stakeholder interests in Project and Programme objectives and activities/outputs; and
- (iii) identify and develop opportunities for the project to benefit stakeholders.

The Project Document has a specific Outcome dedicated to Public Participation. Outcome 4, titled *A Comprehensive Public Participation Initiative Enables Stakeholders to Engage in Programme Activities*, includes two activities/outputs. Activity/Output 4.1 would result in the piloting of a Distance Learning and Information Sharing Tool, or DLIST, while the other activity/output would result in the development and implementation of a set of public involvement, participation, and environmental education initiatives. Activity/Output 4.2 would be undertaken in close collaboration with the Africa Coelacanth Ecosystem programme (ACEP) and would focus on the achievement of direct public involvement in project related activities and environmental education initiatives in the region.

***Activity/Output 4.1: A Distance Learning and Information Sharing Tool (DLIST) is developed and piloted***

DLIST ASCLMEs aims to provide a mechanism for distance learning and information sharing to coastal players along the diverse and populated coast of East Africa. DLIST ASCLMEs will:

- **Bridge the information gap among the array coastal players.** DLIST provides a platform where information about coastal development issues can be made accessible to all stakeholders - from government to NGOs, regional programmes and coastal communities. DLIST can become a central point to access not only documents and photos about the LMEs and their management, but also about opportunities for coastal players to access training, funding and various events.
- **Promote the sharing of “lessons learned”.** DLIST will facilitate the growth of an expanding network of coastal players in the region. Information about the different programmes, projects and organizations will be made available on DLIST, and the platform will provide space to discuss the initiatives, share experiences, identify synergies between programmes, and explore possibilities for cooperation.
- **Enhance the coastal players’ knowledge for LME management.** Through DLIST people along the coast will have access to distance learning courses about coastal development and management.
- **Promote public participation in LME management.** Initiatives and programmes that are implemented in the region to protect the marine and coastal environment can use DLIST as a link to the coastal communities, the inhabitants of which are their ultimate beneficiaries. Programmes such as those under this GEF programmatic approach will have in DLIST a platform to disseminate and retrieve information from stakeholders at all levels, thereby

widening public participation. The same is true for national and local initiatives such as integrated development planning, national strategies, and community-based natural resources management. The ultimate aim of DLIST ASCLMEs is to empower coastal communities and other players to participate in LME management.

- **Facilitate access to information on livelihood options.** DLIST, through a help function as well as a message board, will not only announce opportunities but will provide access to information on poverty reduction programmes, alternative energy sources, low-technology solutions, and generally will serve as a forum for discussion on country-driven poverty reductions schemes as they unfold.

### *Target population*

Aiming to link and bridge the information gap between the different coastal players in the ASCLMEs, DLIST targets the coastal populations in the countries flanked by these LMEs. Many coastal areas are densely populated, and in some countries such as Mozambique the majority of people live in coastal areas. While many large international and regional organizations have a strong presence in East Africa, and various programmes have been set up to protect and contribute to the sustainable management of the region's resources, the gap to community-based groups and NGOs has yet to be bridged. DLIST will target these coastal communities by giving them a voice and access to information that they would not otherwise have. It should be realized that there are four major languages in the region - Kiswahili, French, Portuguese and English - and that the region's multi-lingual nature needs to be taken to account, either by creating different streams on one site, or developing mirror sites that are quasi-independent of one another.

### *Components and functions*

The development of DLIST ASCLMEs will draw from the experience gained with DLIST Benguela. It will build on the existing Benguela IT platform and use the same structure, adapted as needed to ASCLMEs regional conditions and needs.

### *DISTANCE LEARNING*

DLIST utilizes distance learning and information sharing to meet its objectives. DLIST-Benguela has established one accredited course on *Sustainable Development in Coastal Areas* at CPUT during the Benguela pilot phase, and more tertiary institutions in Namibia and Angola are interested in housing course variations during the second phase. In the ASCLMEs, a populated and diverse area, it may be advisable to create at least three distance courses to accommodate the three major languages spoken in the region (English, French and Portuguese). Universities in mainland Tanzania, Zanzibar and Madagascar have already shown interest in seizing this opportunity. CPUT will support the expansion of the distance learning component in Namibia and Angola and will, in the same way, collaborate with institutions along the east side of the African continent. The exact nature of the courses and the link between them will need to be defined during the course of DLIST implementation by the universities and potential students using "lessons learned" from DLIST-Benguela. The courses will, however, be part of the universities' curricula to ensure sustainability.

For historical and geographic reasons Zanzibar is ideally located for DLIST. It is a place where ideas have mixed and results exported for more than a millennium. An additional advantage is its location, where the Somali and Agulhas currents split. It is English speaking, home to organizations important in the region such as the Western Indian Ocean Marine Science Association (WIOMSA) and the Institute of Marine Science (IMS), and is attracting considerable funding to improve connectivity, ICT infrastructure, and raise ICT access and literacy. In a meeting convened by the Minister for Education of the Revolutionary Government of Zanzibar (RGZ), where key officers and directors responsible for distance learning and curriculum development were present, the Ministry's office has shown great interest in hosting a DLIST activity in Zanzibar. The State University of Zanzibar (SUZA) emerged as the institute where DLIST can be installed as an accredited course accessible to

anyone in the A&S LMEs. The University has strong and official links with several institutions. In a special initiative funded by the RGZ and UNDP, an ICT platform will be created linking SUZA, Karume College and the Zanzibar Institute for Finance Administration (ZIFA). SUZA will lead this initiative and host a new server coming from the UNDP country office. SUZA is also embarking on a distance learning programme under the Institute of Continuing Education (ICE). The University has good ICT infrastructure as well as space in the Geography and IT departments that can be dedicated to distance learning. SUZA can thus contribute with space, ICT equipment and staff time as in-kind matching funds for DLIST. With a view to using DLIST to install expertise, perspective and awareness in other tiers of society, the links that SUZA has with other organizations and the emerging SUZA/ Karume College/ ZIFA ICT platform and the ICE will play a key role in making it accessible to teachers and the technical sector.

The course content will be developed utilizing local expertise guided by a Steering Committee supported by experts. Local institutions that will contribute include the IMS, the SUZA Departments of Science and Geography and the University of Dar es Salaam. Fruitful discussions have also already been held with the University of Dar es Salaam, an institution that clearly has much to contribute to the creation of the DLIST distance learning platform. The University of Dar es Salaam can anchor DLIST on mainland Tanzania and, depending on the needs and further interest, can establish a more academic version there with modules created by academic staff in addition to the content provided under the coordination of SUZA.

New or adapted versions of the course will be developed for Portuguese and French-speaking audiences in the ASCLMEs. The University of Toamasina in Madagascar has showed interest and will participate through the Department of Natural Resources and Environment Management (GRENE, *Gestion des Ressources Naturelles et de l'Environnement*). Discussions with the University Eduardo Mondlane will also be held at the start of the Project implementation to investigate the feasibility of housing a course there.

#### *INFORMATION SHARING*

The information sharing component of DLIST will provide coastal players mechanisms to access and contribute information (library of documents and photos), to air views and discuss issues (discussion forums), update themselves about events and funding, training and other opportunities (message board), become part of a network of organizations and individuals that have an interest in coastal development in the region (partner kiosks), and request and access expert assistance for help on issues dealing with environment and coastal development (a “911” help function).

These functions that will be implemented for the ASCLMEs Programme are already part of DLIST-Benguela and have through time been improved and modified based on feedback received from DLIST users. They are considered useful functions for the coastal players in the ASCLMEs region, yet the exact modalities will be defined during discussions with stakeholders in the region and tested in a pilot phase to suit the regional characteristics and needs in terms of information sharing. DLIST ASCLMEs will build on the IT platform created for DLIST Benguela and a close relationship will be maintained between the two DLISTs. Francois Odendaal Productions (FOP) will assist in the creation of a photo library on DLIST-Benguela and stands ready to do the same on DLIST ASCLMEs. The Zanzibar Press Club has already committed to take on public awareness and broader environmental education through their active members (numbering over fifty) and strong contacts in mainland Tanzania and Kenya.

Based on the results of the preparation phase, DLIST will be implemented through a set of activities organized in five components as described below (Table 1). A two -year implementation period is being considered. As an evolving portal that needs to be continuously refreshed and adapted to meet emerging needs of the coastal players, some activities will be enhanced or further detailed during implementation.

**Table 1. Activities for implementation of DLIST ASCLMEs**

COMPONENT	ACTIVITIES
1. Defining the concept	1.1 Discussing information sharing needs and the role of DLIST 1.2 Sharing of “lessons learned” with other LMEs 1.3 Development of indicators for monitoring and evaluation 1.4 Discussing creation of information nodes at universities and CBOs
2. ICT platform	<ul style="list-style-type: none"> <li>•Assessment of available IT expertise</li> <li>•Portal design</li> <li>•Engagement and training of IT staff</li> <li>•Test run and maintenance of portal</li> </ul>
3. Distance course development	3.1 Assessment of needs and options for course development 3.2 Modules writing and course preparations 3.3 Test run the courses during pilot phase
4. Knowledge management	4.1 Review of initiatives in the region 4.2 Review of coastal players 4.3 Engaging DLIST partners 4.4 Elaborating and maintaining the information database about the A&S LME 4.5 Promoting discussion and information sharing 4.6 Training and backup support to DLIST partners
5. Outreach	5.1 Disseminating DLIST among coastal players 5.2 Creating focal points 5.3 Overcoming obstacles imposed by current ICT infrastructure 5.4 Using video to reach a broad-based audience

*DEFINING THE CONCEPT*

Before actual implementation of DLIST, it is important to define *what* will be implemented and *how* it will be monitored and evaluated. Discussions on the concept of DLIST ASCLMEs will build on the results of the preparatory activities of the ASCLMEs project and on experience gained through DLIST Benguela. ASCLMEs preparatory phase discussions were held more actively in some countries than others (particularly Tanzania and Madagascar). These discussions will be extended to the other participating countries immediately upon implementation. Approximately 4 months will be needed for these initial activities.

- *Discussing information sharing needs and the role of DLIST:* discussions with coastal players will be continued to further assess information sharing needs in the region and the role that DLIST can play. The broad functions that the two components of information sharing and distance learning will include and the modalities in which they should be created (e.g. languages) will also be defined.

- *Sharing of “lessons learned” with other LMEs:* The development of DLIST ASCLMEs will benefit from the experience gained from DLIST Benguela through interaction, technical support and use of expertise created to train people in the ASCLMEs. The DLIST Benguela portal should be used in the beginning to promote discussions around the new DLIST—as it is happening already—and the sharing of “lessons learned” with other LMEs should be promoted through cross visits and establishment of links with other LMEs.
- *27. Development of indicators for monitoring and evaluation:* Based on the experience gained from DLIST Benguela, mechanisms should be developed to measure change in terms of the project aims, not only through web statistics but in terms of community empowerment as a consequence of information sharing and use.
- *Discussing the creation of information nodes at universities and CBOs:* Local ownership should be ensured by discussing in detail how information nodes can be created at universities and community-based institutions. Particular attention should be paid to devolving ownership to local institutions, several of whom have requested follow-up workshops to plot the trajectory of their future involvement. Many of them are currently updating ICT capability and forming alliances with other institutions so that detailed discussions will be necessary by the time DLIST funding flows to update and harmonize activities with current scenarios.

#### *ICT PLATFORM*

Putting the ICT structure for DLIST in place (including the server, portal and IT support) can start immediately after concept definition and will require approximately 6 months.

- *Assessment of available IT expertise:* Options available for hosting and maintaining the server, as well as designing, launching and maintaining the portal, need to be assessed. CPUT’s support and advice will be key in this phase. Provided there is capacity and expertise, the server should be located and maintained in the region.
- *Portal design:* When the functions of DLIST ASCLMEs are defined, the web application, design and graphics should be developed building on the existing DLIST Benguela portal and using the experience from DLIST Benguela and other ICT platforms and drawing on local expertise as far as possible. The way in which the two existing DLIST portals should be linked will also be defined.
- *Engagement and training of IT staff:* IT staff in the universities that will be involved in the distance learning component will be trained on web development and maintenance of the portal (and server if housed in one of the universities involved). DLIST administrators and course administrators in the universities in several countries will also be trained on the basics of portal maintenance and course online administration. CPUT will assist in training and building ICT capacity to maintain DLIST. Other institutions in the participating countries will also receive training.
- *Test run and maintenance of portal:* The portal will be installed, test run by IT staff and DLIST users, and maintained continuously.

#### *DISTANCE COURSE DEVELOPMENT*

Activities will be undertaken to identify interest and opportunities for development of distance courses, as well as to prepare and test run the courses. An estimated 9 months will be required to launch the first pilot course.

- *Assessment of needs and options for course development:* Building on discussions held in mainland Tanzania, Zanzibar and Madagascar during the PDF B phase, and based on future



discussions in other countries such as Mozambique, options for DLIST courses will be assessed. The assessment will be based, firstly, on the interest of the academic institutions and, secondly, on the current curricula and existence of courses that could potentially be adapted to the DLIST platform, as well as on the human resource and IT capacity existent in the university. The experience acquired by CPUT with the DLIST course during the pilot phase will be shared with lecturers and staff from other interested academic institutions, and options for course variations will be discussed at that time.

- *Modules writing and course preparations:* The courses will be developed by local stakeholders with support from the DLIST team. CPUT University staff and other coastal players will be involved in writing the modules for the courses. Information from programmes such as the GEF programmatic approach for the ASCLMEs will be summarized and used to update course material. Case studies will be developed in collaboration with DLIST partners such as regionally and nationally based NGOs. The courses will be packaged and loaded on the DLIST portal. The multi-lingual nature of the region will need to be incorporated either by producing translated versions of one course or by producing different courses in different languages (which can in a later stage be translated into other languages).
- *Test run the courses during pilot phase:* In the first two years the courses will be tested and improved based on feedback from distance learners. The students themselves will be involved in developing new case studies.

#### KNOWLEDGE MANAGEMENT

A set of activities will be executed over the implementation period to ensure wide benefits to users of the DLIST information sharing component. Partners that can contribute and benefit from DLIST will be identified, as will mechanisms to enhance information access and sharing.

- *Review of initiatives in the region:* A detailed review will be carried out of initiatives, including GEF-funded projects and programmes as well as those funded by other donors that are planned or ongoing in the region and may have an impact on DLIST ASCLMEs activities and/or can benefit from the information sharing capabilities of DLIST. This review will build on results from the PDF B phase of the ASCLMEs Project.
- *Review of coastal players:* A synoptic review of existing and emerging structures, organizations, government departments and institutions will be carried out in each country. This review will build on results of the PDF B phase (see Appendix II). Preliminary results of PDF B activities indicated that databases of NGOs exist in some countries such as Mozambique, while extensive work is needed to identify NGOs and CBOs in others such as Madagascar. This review will also assess how they can become involved in, and benefit or contribute to the “common pool of knowledge” that will be generated by DLIST ASCLMEs.
- *Engaging DLIST partners:* The DLIST network will build upon the results of the PDF B phase and the review of programmes and coastal stakeholders. Assistance will be provided to coastal players in opening kiosks and learning how to use and contribute to the different functions offered on the portal.
- *Elaborating and maintaining the information database about the ASCLMEs:* A photo library will be created, and documents scanned and posted in the DLIST library. Partnerships with libraries in the region will be established through which libraries will post documents on the DLIST Library and, at the same time, the entire DLIST Library will be replicated and made available in the library in question. Partnerships can also be sought to make regional newsletters available on the DLIST portal.
- *Promoting discussion and information sharing:* Local moderators will be engaged to facilitate and stimulate online discussions and make sure that all issues raised have feedback.

There will be moderators in several countries dedicated to issues considered by DLIST users as more relevant to the ASCLMEs.

- *Training and backup support to DLIST partners:* Training and backup support on communication, information knowledge and proposal writing will be provided to DLIST users to enable them to best use the platform to share information to widen their knowledge and apply it. Experts in the region will be approached to form a resource group to respond to queries posed by DLIST users through the “911” help function.

## OUTREACH

Activities to disseminate DLIST among coastal players and bring it closer to coastal communities will be undertaken throughout the period of implementation.

- *Disseminating DLIST among coastal players:* A set of local meetings or workshops, in ASCLMEs coastal areas, will gather coastal players to show what DLIST is and discuss how DLIST can be made useful in the local context. Some of these workshops will be conducted in conjunction with DLIST partners or in the framework of programmes targeting the coastal areas, such as the GEF programmatic approach to sustain the ASCLMEs. Visits to coastal communities, road shows, and other events will be organized to bring DLIST closer to the ground.
- *Creating focal points:* The provision and training of focal points will contribute to making DLIST more accessible to communities in rural areas. DLIST partners and focal points can play a role in bridging the gap between DLIST, and people who still cannot use DLIST, by transmitting information orally or through community radio stations. While it is impossible to reach everyone in the coastal areas, DLIST has the potential to link different role players and promote the spread of information through a growing network of informed and updated stakeholders.
- *Overcoming obstacles imposed by current ICT infrastructure:* The reality is that, at least for the moment, ICT is dependent on phone lines. However, new technology is already being instituted to overcome this obstacle. The Radio and Internet Technology for Communication (RANET) initiative uses the *WorldSpace* satellite to download information via a small, inexpensive receiver, and it is predicted that a two-way exchange of information will be possible within a year to 18 months. The satellite’s shadow covers all of Africa and most of the WIO. The climatic and weather service based in Dar es Salaam is already a major player in this field, and it is anticipated that diverse information will be able to be uploaded from multiple locations in the region using community radio stations. Already DLIST is exploring the possibility of linking into this network and preliminary discussion at National Oceanic and Atmospheric Administration (NOAA) in Washington reveals that many possibilities exist for collaboration to truly bring DLIST “to the ground” using the new technology.
- *Reaching the broad-based public including political office holders whose buy-in is required for the programme to reach its full potential:* Preliminary lessons learned from the pioneering BCLME Programme show that the importance of broad-based awareness building and drumming up public support cannot be overestimated. Video capability will be utilized to its full potential. A promotional film as well as a documentary (to some extent relying on the same material) will be produced, with the potential of cutting short fillers, snippets and longer educational films for distribution in the school system and in other educational institutions. DVDs, CDs, etc. will be standard components of other DLIST outreach materials. The film will also be made available in streaming video on the internet through the DLIST website. FOP has a vast archive of film material of certain areas in the WIO that it is willing to make

available to the ASCLMEs Programme free of charge so that funding from the GEF will be easily matched by this contribution, and need to be applied only to shooting new material and editing the required products. FOP films have frequently been shown in the region in a number of languages. This activity will complement work undertaken in the environmental education and learner programs described in Activity/Output 4.2.

***Activity/Output 4.2: A set of public awareness and participation activities and environmental education initiatives are developed and implemented in the region.***

The activities and outputs of this Component will be achieved in close collaboration with the ongoing public involvement and participation, and environmental education initiatives of the ACEP, and will link with DLIST activities described above. The overall objective of project and programme supported public awareness, participation and environmental education activities will be to enable people to both inform and be informed by the range of activities undertaken during project and programme implementation. As with DLIST, activities under Activity/Output 4.2 will facilitate stakeholder access to, and foster an understanding of scientific information.

Project/Programme public awareness activities, coupled with those of the ACEP, will center on *broad stakeholder participation* in project/programme activities, and *environmental education and learner programmes*.

#### *Broad Stakeholder Participation*

The project will assure broad stakeholder involvement through rigorous, ongoing work of identification of stakeholders affected by and/or with an interest in the activities and outputs of the project. Annex 1 of this Plan, prepared during appraisal, contains a list of such stakeholders. It is estimated that the project will hold approximately 160 workshops and meetings at country and regional level. Broad stakeholder involvement is crucial to the success of the TDA/SAP development process at project and programme level. Over 60 country-based and regional level meetings workshops are foreseen as necessary to assure stakeholder involvement consistent with principles outlined earlier. Stakeholder participation activities will be closely coordinated with activities undertaken by DLIST ASCLMEs.

The project will also organize and host a Partnership Symposium in the second half of the project lifecycle. The purpose of this Symposium will be to highlight the achievements of all 3 sister projects under the Programme umbrella for the ASCLMEs, to identify next steps in relation to operationalizing the SAPs, developing management approaches, and continuing to monitor selected indicators and parameters necessary to sustainably guide ecosystem-based management and policy in the region. This Symposium will also help to develop the necessary working relationships with and between public and private sector partners and NGOs which will be crucial to the implementation of the SAP.

#### *Environmental Education and Learner Programmes*

The project, working within ongoing ACEP efforts at country and regional level, will assist in the development of marine environmental education stakeholders who, working together in a decentralized fashion to promote environmental processes in all focal countries, will develop materials for and engage educational resources in the region to further the objectives of the projects within the programme. Environmental Education and Learner Programmes will:

- Support meaningful involvement of EE practitioners in the region;
- Create a wide range of networking opportunities that enable practitioners from diverse situations to contribute to and benefit from the programme;
- Assure that all participants are recognized as valuable networking partners;

- Be open ended networks that are encouraged to build on existing networks without subsuming them; and
- Assure transparency and accountability in the development and operation of a networking process in the region.

Outputs of activities undertaken in environmental education and learner programmes will include:

- Creation and documentation of networking opportunities for, between, and among key marine education stakeholders within the region;
- Implementation of an annual meeting and workshops;
- Create, maintain, and ultimately transfer to an agreed upon repository a database of stakeholders, trainees, educators etc.;
- Work within existing regional groups e.g. EEASA, CI, WIOMSA, WWF, NEPAD, SADC to give value added to project activities;
- Enhance the capacity of institutions and organizations to provide appropriate support to environmental education processes and practitioners; and
- Provide networking publications (DLIST, print, use of the project/programme website)

To support the development of capacity within the region to access, use and develop appropriate marine resource materials, the project will work with the ACEP to:

- Create and afford public access to a catalogue of existing materials (review);
- Create and make available to stakeholders project related resource materials for marine related topics and new scientific information;
- Identify gaps and work in a participatory manner to develop newly available science practice and actions into activities with other identified materials;
- Develop curricula appropriate educational materials based on scientific programmes; and
- In general, contribute to the development of national and regional marine based resources.

To support the development of capacity within the region to respond to marine environmental issues through improved educational processes and training activities, the project will work with the ACEP to:

- Survey existing courses and course opportunities, and inform teachers at primary, secondary and university levels of these opportunities;
- Involve teachers directly in planning for course development and the documentation of outcomes;
- Develop new science communication courses;
- Support capacity building in courses related to identified needs;
- Develop and document distribution of professional development initiatives related to resource materials; and
- Develop and document an accountability and evaluation process between partners and in courses developed and offered by the project and its partners.

To support an active network of marine environmental education stakeholders working together in a decentralized fashion to promote environmental processes in all focal countries, the project will assist ACEP to:

- Create and document networking opportunities for, between and among key marine education stakeholders within the region;
- Design and implement annual meetings and workshops;
- Create, maintain, and ultimately transfer to an agreed upon repository a database of stakeholders, trainees, educators etc.;

- Work within existing regional groups e.g. EEASA, CI, WCS, WIOMSA, WWF, NEPAD, SADC to give value added to project activities;
- Enhance the capacity of institutions and organizations to provide appropriate support to environmental education processes and practitioners; and
- Provide networking publications (through DLIST ASCLMEs, print, and designated project/programme website).

To support the development of capacity within the region to access, use and develop appropriate marine resource materials, the project will assist ACEP to:

- Create and afford public access to a catalogue of existing materials (review);
- Create and make available to stakeholders project related resource materials for marine related topics and new scientific information;
- Identify gaps and work in a participatory manner to develop newly available science practice and actions into activities with other identified materials;
- Develop curricula appropriate educational materials based on scientific programmes; and
- In general, contribute to the development of national and regional marine based resources.

To support the development of capacity within the region to respond to marine environmental issues through improved educational processes and training activities, the project will assist ACEP to:

- Survey course opportunities that are available for teachers at primary, secondary and university levels;
- Directly involve Teachers in planning for course development, and document outcomes of these efforts;
- Develop New science communication courses for use at the classroom level at different institutional levels;
- Support capacity building in courses related to teacher-identified needs;
- Develop and document distribution of professional development initiatives related to resource materials; and
- Develop and document an accountability and evaluation process between partners and in courses developed and offered by the project and its partners.

## Annex 1: Public Participation Analysis

Stakeholders including partners in implementation, target groups and beneficiaries of the outcomes/outputs of the Project can be grouped into a number of categories. The principal categories are:

- Participating in the implementation of the project in different roles: Information providers (working on the same areas), provision of staff and students to participate in the project's activities; provision of facilities; provision of institutional framework for dissemination of information to the relevant national and regional mechanisms
- Beneficiaries (Information consumers) – for scientific purposes, decision-making processes on management, conservation and investments
- The coastal population and other users of coastal and marine resources whose livelihoods and activities are dependent on sustainable utilization of the resources.

Key stakeholders	Mandate/Functions/capability	Potential Role in ASCLMEs Programme
<b><i>Regional/International intergovernmental organizations</i></b>		
The Nairobi Convention	Provide a framework for regional cooperation in the protection, management and development of the WIO region's marine and coastal environment. The current key roles of the Convention are: <ul style="list-style-type: none"> <li>○ Setting inter-governmental dialogue and setting regional priorities</li> <li>○ Building capacity within the Governments</li> <li>○ Assist with and catalyze action through national and regional institutions</li> </ul>	<ul style="list-style-type: none"> <li>▪ Through its Meeting of the Contracting Parties, provide a framework for reporting the results of the ASCLME Programme as well as for interaction with decision-makers and representatives of national</li> <li>▪ Facilitate the development of TDA and SAP</li> </ul>
New Partnership for African Development (NEPAD)	The fundamental objective of NEPAD is to eradicate poverty through sustainable development. NEPAD recognizes that a healthy productive environment is key to poverty reduction. Its coastal and marine activities are coordinated by the Coastal and Marine Sub-theme (COSMAR) hosted by the Government of Kenya within the National Environment Management Authority (NEMA).	<ul style="list-style-type: none"> <li>▪ NEPAD provides a framework for inter-governmental dialogue at the continental level, through which ASCLME and other LME projects could present their results and influence decisions</li> </ul>
The Marine Sector Coordinating Unit of the South African Development Community (SADC)	The objective of the Unit is to promote the development of sustainable marine fisheries in the SADC coastal region. Eight countries are involved in this program: Angola, Democratic Republic of Congo, Mauritius, Mozambique, Namibia, Seychelles, South Africa, and Tanzania. SADC has implemented or is	<ul style="list-style-type: none"> <li>▪ ASCLME Programme could use the data from the SADC's fisheries monitoring projects as baseline for its fisheries monitoring programme</li> </ul>

	implementing fisheries monitoring projects in several member countries.	
Indian Ocean Commission (IOC)	The Commission is an intergovernmental organization whose membership comprises of Comoros, Madagascar, Mauritius, Mayotte, Reunion, and the Seychelles. It encourages cooperation in diplomacy, economy, trade, agriculture, maritime fishing, and the conservation of resources and ecosystems. IOC will coordinate the implementation of the “Regional Programme for the Sustainable Management of Coastal Zones of the Countries in the Indian Ocean”, which aims at increasing the ability of the participating countries to take appropriate initiatives in the sustainable management of coastal areas and resources, thereby contributing towards poverty alleviation for coastal populations.	Through the following activities of the programme contribute information to the ASCLME Programme’s outputs/activities such as 1.1 Prioritised ecosystem assessment and management gaps in ecosystemic processes in key geographic areas of the ASCLMEs addressed and 3.5 TDA and SAP finalized <ul style="list-style-type: none"> <li>▪ Support data collection of coastal and marine biodiversity including fish and other commercial resources</li> <li>▪ Develop regional policy strategy for sustainable coastal management</li> </ul>
Indian Ocean Tuna Commission (IOTC)	IOTC is an intergovernmental organization mandated to manage tuna and tuna-like species in the Indian Ocean and adjacent seas. It promote cooperation among its members with a view to ensuring, through appropriate management, the conservation and optimum utilization of stocks and encouraging sustainable development of fisheries based on such stocks. It is currently implementing a research project entitled “Indian Ocean Tropical Tuna Tagging Programme (IOTTP)”.	<ul style="list-style-type: none"> <li>▪ Provide a framework for dissemination of information from ASCLME Programme</li> <li>▪ Data and information from IOTTP could be used in the activity 1.1 Prioritised ecosystem assessment and management gaps in ecosystemic processes in key geographic areas of the ASCLMEs addressed</li> </ul>
Southwest Indian Ocean Fisheries Commission (SWIOFC)	The Commission is an advisory body aimed at promoting the sustainable development and utilization of coastal fishery resources off the shores of East Africa and several island states of the region, as well as responsible management and regional cooperation on fisheries policy. Its main focus will be: <ul style="list-style-type: none"> <li>○ Improvement of fisheries data collection and on providing resource managers with much-needed information on the status of stocks</li> <li>○ Development of an agreement on high-seas fishing of non-tuna resources</li> </ul>	<ul style="list-style-type: none"> <li>▪ The Commission provides a framework for inter-governmental dialogue at the continental level, through which ASCLME could present their results and influence decisions</li> <li>▪ Provide a framework for dissemination of information from ASCLME Programme</li> </ul>
<b>REGIONAL AND INTERNATIONAL PROGRAMMES/PROJECTS</b>		
Ocean Data and Information Network for Africa	The ODINAFRICA project aims to build oceanographic data and information management capacity in Africa to enable	<ul style="list-style-type: none"> <li>▪ The ODINAFRICA project has provided support to NODCs in</li> </ul>

(ODINAFRICA)	<p>the development of relevant products and services contributing to the sustainable use and management of ocean and coastal areas. More specifically, the current phase aims to construct a Pan-African coastal observing system including a core network of tide gauges, but also making other in situ measurements where appropriate. Activities undertaken include:</p> <ul style="list-style-type: none"> <li>○ Strengthen the National Oceanographic Data Centres (NODC) to enable them to produce the necessary products and services</li> <li>○ Strengthen the in situ observations and measurements including GLOSS network of sea-level measuring stations in Africa</li> <li>○ Add oceanographic and meteorological sensors to sea-level measuring stations</li> <li>○ Create Harmful Algal Blooms monitoring programmes in places where they occur frequently</li> </ul>	<p>different countries to identify, collect and achieve national and regional oceanographic data</p> <ul style="list-style-type: none"> <li>▪ Play a key role in the regional discussions to decide upon the mechanisms for synthesizing national and regional data and repatriating and incorporation of extra-regional information</li> </ul>
<p><b>Coral Reef Degradation in the Indian Ocean (CORDIO)</b></p>	<p>The CORDIO Programme was set up in 1999 in response to the bleaching and mass coral mortality as a result of the 1998 El Nino. Currently much of the research is focusing on mitigation of damage to reefs and on alternative livelihoods for people dependant on reefs that are being degraded due to climate change and other stress factors.</p> <p>CORDIO has assumed the role of the Regional Node for the Global Coral Reef Monitoring Network (GCRMN) in East Africa. CORDIO is also responsible for coordinating the preparation of the annual status report of coral reef in the region.</p> <p>The current 2004-2006 programme will focus more on reporting and interpretation of research results, development of GIS and databases, and investigation of the implications of bleaching on MPA design and sustainability.</p>	<ul style="list-style-type: none"> <li>▪ Contributing information to ASCLME Programme, from its project on monitoring of the biological and physical status and socio-economic aspects of coral reefs</li> <li>▪ Potential users of the climate change-related data and information from ASCLME Programme</li> </ul>
<p>Coral Reef Targeted Research and Capacity Building for Management Project (CRTR)</p>	<p>With funding from the GEF and the World Bank, the CRTR project aims at supporting the establishment of an applied research framework and build capacity for science-based management of coral reefs in areas with significant coral reef resources.</p> <p>The project is implemented in four areas (Eastern Africa, Australia, Mexico and Philippines) by members of the six Scientific Working Groups. These groups are dealing with six themes namely: coral bleaching, coral diseases, remote sensing, modelling and decision-support tools, remediation and</p>	<ul style="list-style-type: none"> <li>▪ Potential users of the information from ASCLME Programme for its coral bleaching, modeling and decision-support tools and connectivity themes</li> </ul>



	restoration and connectivity.	
Transboundary Networks of Marine Protected Areas for Integrated Conservation and Sustainable Development: Biophysical, Socio-economic and Governance Assessment in East Africa (TRANSMAP)	<p>The goal of this three-year project is to develop scientific knowledge for the creation of transboundary networks of MPAs in the East African region. In particular relating to type, size and location of reserves, which together can maintain ecological functions, resource-uses and future socio-economic developments.</p> <p>The transboundary case study areas proposed herein constitute important biogeographical units with unique character: 1) in the boundary between South Africa and Mozambique which comprises the Greater St Lucia Wetland Park World Heritage Site and 2) in the boundary between Mozambique and Tanzania.</p> <p>Twelve institutions from three European countries (Portugal, Sweden and United Kingdom) and three Eastern African countries (Tanzania, Mozambique and South Africa) are involved in the implementation of different components of the project. The institutions from the Eastern Africa region are: Oceanographic Research Institute and University of Cape Town (South Africa); University Eduardo Mondlane and Centre for Sustainable Development for Coastal Zones (Mozambique); Institute of Marine Research (Tanzania) and the Western Indian Ocean Marine Sciences Association.</p>	<p>Provide the following information to the ASCLME Programme:</p> <ul style="list-style-type: none"> <li>▪ Migration patterns of selected fish in case-study areas</li> <li>▪ Genetic structure of populations along the geographical range</li> <li>▪ Database on coastal-zone use and change</li> </ul>
Fish Aggregating Devices as Instrumented Observatories of pelagic ecosystems (FADIO)	<p>This is a European Union-funded project, which is implemented around the Seychelles in the Indian Ocean and Hawaii in the Pacific Ocean. The main objective of this programme is to develop new observation instruments to better study the behavior and abundance of pelagic fish (in particular tunas). The instruments to be used are electronic tags and new-instrumented Fish Aggregating Devices (FADs).</p>	<ul style="list-style-type: none"> <li>▪ Provide the information on the behavior and abundance of pelagic fish (in particular tunas) to the ASCLME Programme</li> </ul>
African Coelacanth Ecosystem Programme (ACEP)	<p>Acknowledging that there is limited information on the deep-water ecosystems in the WIO region, ACEP was initiated to explore the western Indian Ocean to promote the wise collective management of marine resources, sustainability and an improved quality of life for all countries involved. ACEP has adopted a biophysical, process-orientated approach to its science, using the coelacanth as the unifying animal, and the south Equatorial Current and its branches to the north past Tanzania and Kenya, as well as to the south through the</p>	<ul style="list-style-type: none"> <li>▪ Provide the Research Vessel <i>F.R.V. Algoa</i>, for Programme's activities</li> <li>▪ Provide data collected from its cruises in the region</li> </ul>

	<p>Mozambique Channel, as the unifying force.</p> <p>The programme has undertaken research and training in Mozambique, Tanzania, Kenya, Comoros, Seychelles and Madagascar, using the South African research vessel <i>F.R.V. Algoa</i>. ACEP research programme includes physical oceanography, current measurements, and the collection of biological specimens as well as other data monitoring the entire ecosystem. The programme covers all oceanic and coastal areas to the 50-meter isobath.</p>	
<p>Responses to climate change Impacts: Building coastal resilience</p>	<p>This GEF-funded project is implemented by WWF in four countries namely, Cameroon, Fiji, India and Tanzania. The project aims at building the capacity of natural resources managers to assess vulnerability and to adapt management strategies to respond to expected climate change impacts. Vulnerability assessments will be conducted in each focal area and this information will be used to craft adaptation responses. In Tanzania the project activities will be implemented in the Mafia Island and Kilwa District.</p>	<ul style="list-style-type: none"> <li>▪ Potential users of the climate change-related data and information from ASCLME Programme</li> </ul>
<b>REGIONAL AND INTERNATIONAL NGOS</b>		
<p>WWF</p>	<p>The WIO region is divided into two ecoregions namely, Eastern African Marine Ecoregion (EAME) (Somalia, Kenya, Tanzania Mozambique and South Africa) and Western Indian Ocean Marine Ecoregion (WIOMER)(Comoros, Madagascar, Mauritius, Réunion and Seychelles). These are amongst the WWF Global 200 ecoregions. These Ecoregions feature globally outstanding biodiversity, endemism and species abundance. Their priority activities include addressing the following issues: Destructive fishing practices, including dynamite fishing, shrimp farming in mangrove forests, bottom trawling, fishing with mosquito nets, live coral extraction, over-harvesting of critical species, sea turtle harvest, and IUU (illegal, unregulated and unrecorded) fishing by foreign vessels, including shark fining, and inadequate policies and regulation for marine resource management.</p>	<ul style="list-style-type: none"> <li>▪ Contributing information on artisanal and subsistence fisheries from the MPAs it is supporting in the region. These include: Mafia Island Marine Park and Menai Bay Conservation Area (Tanzania); Quirimbas National Park and Bazaruto Archipelago National Park (Mozambique) and Parc National de Masoala (Madagascar)</li> </ul>
<p>Wildlife Conservation Society (WSC)</p>	<p>WSC through its Marine Program has conducted many research and conservation projects in the WIO region, including ecological assessments and monitoring of coral reefs in Kenya, Tanzania, Mauritius and Madagascar; fisheries management</p>	<ul style="list-style-type: none"> <li>▪ Contributing information to ASCLME Programme, from its ecological assessments and monitoring of coral reefs in Kenya,</li> </ul>

	<p>studies in Kenya, Tanzania and Madagascar; MPA management effectiveness studies in Kenya's MPAs; humpback whale studies in Antongil Bay, Madagascar, and assessment of conservation needs for great white sharks in South Africa. Currently, WCS marine program activities focus mainly on:</p> <ul style="list-style-type: none"> <li>○ assessment of MPAs for biodiversity protection and fisheries management</li> <li>○ global climate change and effects on marine ecosystems</li> <li>○ effects of fishing practices and indigenous management on fisheries catches, species diversity, and reef ecology</li> <li>○ methods to restore coral reefs that have been degraded by heavy fishing, pollution, or coral bleaching</li> <li>○ assessments of the effectiveness of management of current systems</li> <li>○ providing technical advice to relevant government agencies and social organizations in developing sustainable resource use for coral reefs</li> <li>○ capacity building by fostering the professional development and training of marine scientists in coral reef ecology and management practices</li> </ul>	<p>Tanzania, Mauritius and Madagascar; and fisheries management studies in Kenya, Tanzania and Madagascar</p> <ul style="list-style-type: none"> <li>▪ Potential users of the climate change-related data and information from ASCLME Programme</li> </ul>
<p>IUCN-Eastern Africa Regional Office</p>	<p>The Marine and Coastal Programme has been operating since 1992 and aims at assisting the countries of the region with the maintenance of biodiversity and ecological processes of marine and coastal ecosystems, restoration of their function where this has been impaired and the sustainable and equitable use of marine resources. Current priorities of the programme are to provide assistance for effective management of marine protected areas, implementation of integrated coastal zone management and development of sustainably managed fisheries. Other priorities include: introduction of alien species and Climate change – coral bleaching and sea level change</p>	<p>Contributing information to ASCLME Programme, from activities:</p> <ul style="list-style-type: none"> <li>▪ Development of a WIO regional fisheries database - The database provides a synopsis of the scale of operation, socio-economic role, vulnerability and management status of all small-scale fisheries in the region.</li> <li>▪ Pilot research of fish spawning aggregations in Kenya, Tanzania, Mozambique</li> <li>▪ Contributing information on artisanal and subsistence fisheries from the projects to which it provides technical assistance: Tanga Coastal Zone</li> </ul>

		Management Programme; Mnazi Bay Marine Park (Tanzania) and Moheli Marine Park (Comoros).
Western Indian Ocean Marine Science Association (WIOMSA)	<p>WIOMSA was established in 1993 as a regional professional, non-profit, membership organization. It is dedicated to advancing regional cooperation in all aspects of coastal and marine sciences. WIOMSA has succeeded to build a diverse range of experience in organization of training courses, coordinating research granting schemes, advocacy, networking and dissemination of technical information to general public.</p> <p>WIOMSA provides technical and advisory services to the Secretariat of the Nairobi Convention as well as coordinate implementation of its activities.</p>	<ul style="list-style-type: none"> <li>▪ The following MASMA funded projects could contribute information to the ASCLME Programme: <ul style="list-style-type: none"> <li>i) Sustainable Management and Valuation of Seagrass Ecosystems in the Western Indian Ocean Region</li> <li>ii) Determination of the Distribution and Characteristics of Fish Spawning Aggregation Sites (FSAS) and their Importance to the Artisanal Fisheries Resources of Seychelles</li> <li>iii) The effects of coral bleaching on coral reef fish, fisheries and ecosystem services in the Western Indian Ocean</li> <li>iv) Larval settlement rates and reef fish recruitment dynamics in coastal Kenya: Implications for fisheries management and conservation in Eastern Africa</li> <li>v) Seabirds as bio-indicators of tropical marine ecosystems: A regional study in Western Indian Ocean</li> </ul> </li> <li>▪ Provide a framework for organization of planned training courses and workshops</li> </ul>

		under ASCLME Programme
<b>GOVERNMENT INSTITUTIONS</b>		
Ministries responsible for Fisheries	In most of the countries of the region, fisheries matters are under the responsibilities of the Ministry of Natural Resources. The ministries through Division of Fisheries are responsible for development, coordination and enforcement of fishing laws and regulations.	<ul style="list-style-type: none"> <li>▪ Contributing information for the assessment of the artisanal and subsistence fisheries</li> <li>▪ Use the information from ASCLME Programme to determine: the status of offshore resources and based on the information on the distribution and location of nursery areas and spawning and settlements grounds, identify areas requiring immediate protections</li> <li>▪ Participate in the identification of financial sources and revenues generating mechanisms to sustain ASCLME's activities</li> <li>▪ Participate in the institutional and individual capacity building for LME assessments, information management and other related disciplines</li> <li>▪ Participate in the development of TDA and SAP</li> </ul>
Ministries responsible for Environment	<p>These ministries have mainly a coordinating and regulatory role rather than an implementing role. These have been responsible for the formulation of national environmental policy and legislation. Different countries have set up inter-ministerial committee for coordination purposes as well as for ensuring that environmental consideration are incorporated into sectoral policies, programmes and activities of the line ministries. Institutional constraints common to most of the countries:</p> <ul style="list-style-type: none"> <li>○ The institutional capacity to implement policies, laws and regulation is weak</li> <li>○ Institutional roles and competencies are not well defined resulting into gaps and overlaps</li> </ul>	<ul style="list-style-type: none"> <li>▪ Use the information from ASCLME Programme on productivity and larval transport for fish and invertebrates and of mapping of commercially important nursery areas, for zonation and for establishment of protected areas.</li> <li>▪ Provide information from the research and other institutions, on</li> </ul>

	<ul style="list-style-type: none"> <li>○ Limitations in financial, operational and human resources lead to inadequate management, enforcement and monitoring</li> </ul>	<p>stress reduction indicators and environmental status indicators that will be used to monitor results of ASCLME Programme implementation</p> <ul style="list-style-type: none"> <li>▪ Participate in the identification of financial sources and revenues generating mechanisms to sustain ASCLME's activities</li> <li>▪ Participate in the development of TDA and SAP</li> </ul>
GEF-Focal Points	In all the countries of the region, there is a ministry or an institution that have been designed as a GEF Focal point. These focal points are acting as contact institutions for GEF in their respective countries. They have mainly been involved in the development of proposals for submission to the GEF for funding.	<ul style="list-style-type: none"> <li>▪ Act as a link between the ASCLME Programme and the relevant institutions in their respective countries</li> </ul>
Parastatals such as National Environment Management Authority (Kenya) and the National Environment Management Council (Tanzania)	These are the principal instruments of the Governments in the implementation of all environmental policies, coordinating and managing all matters relating to the environment, including education, awareness, planning, establishing standards and enforcement of the law. They are also responsible for monitoring and assessing the state of environment as well as charged with providing an annual national 'State of the Environment Report'	<ul style="list-style-type: none"> <li>▪ Use the information from ASCLME Programme on productivity and larval transport for fish and invertebrates and of mapping of commercially important nursery areas, for zonation and for establishment of protected areas.</li> <li>▪ Provide information from the research and other institutions, on stress reduction indicators and environmental status indicators that will be used to monitor results of ASCLME Programme implementation</li> </ul>
Parastatals responsible for establishment and management of Marine Parks. These include: Kenya Wildlife	These were established to be responsible for the establishment, management and administration of MPAs. They are also responsible for formulation of policies on MPA-related activities and for advising governments on the approval, revision and amendment of management plans.	<ul style="list-style-type: none"> <li>▪ Contributing information for the assessment of the artisanal and subsistence fisheries</li> <li>▪ Use the information from ASCLME</li> </ul>

<p>Services (Kenya); Association Nationale pour la Gestion des Aires Protégées (ANGAP) (Madagascar); Department of Forestry and Wildlife (Mozambique); Marine Parks and Reserves Unit (Tanzania)</p>		<p>Programme to determine: the status of offshore resources and based on the information on the distribution and location of nursery areas and spawning and settlements grounds, identify areas requiring immediate protections</p> <ul style="list-style-type: none"> <li>▪ Participate in the institutional and individual capacity building for LME assessments, information management and other related disciplines</li> </ul>
<p>Government Research and academic institutions such as the University of Nairobi Moi University Jomo Kenyatta University (Kenya); the University of Tulear (Madagascar); the Faculty of Science, University of Mauritius (Mauritius); Department of Physics and Biology, University of Eduardo Mondlane (Mozambique); Universite de La Reunion IRD La Reunion IFREMER La Reunion (Reunion); Institute of Marine Sciences and Faculty of Aquatic Science and Technology (Tanzania); University of KwaZulu Natal and</p>	<p>They were established to provide undergraduate training (some are also offering postgraduate training); undertake research in coastal and marine environment and provide advisory and consultancy services to government, public and other relevant organizations. They have also organized national and regional training courses. With exception of Reunion and South Africa, institutions from the other countries are facing a number of limitations:</p> <ul style="list-style-type: none"> <li>○ Most of their research activities have been concentrated in the near-shore zone</li> <li>○ Majority of their research projects and monitoring activities have been conducted for a short period of time due to limited resources</li> <li>○ Staff and students have few opportunities to participate in relevant field work such as cruises</li> </ul>	<ul style="list-style-type: none"> <li>▪ Contributing data and information on artisanal and subsistence fisheries to ASCLME Programme</li> <li>▪ Participate in the institutional and individual capacity building for LME assessments, information management and other related disciplines</li> <li>▪ Researchers and students participate in the cruises</li> </ul>

the University of Zululand (South Africa)		
Government Research Institutions such as the Kenya Marine and Research Institute (Kenya); Institut Halieutique des Sciences Marines (IHSM) and the Centre National de Recherche Oceanographique (Madagascar); Albion Fisheries Research Centre and Mauritius Oceanography Institute (Mauritius); Instituto de Investigacao Pesqueira (IIP) and IDPPE (Mozambique); Tanzania Fisheries Research Institute (Tanzania)	In most of the countries, they were established by the act of parliament. They were established to promote, conduct and coordinate mainly fisheries research in their respective countries and disseminate research findings to government agencies, public institutions and private companies engaged in the fishing industry. They have also organized national and regional training courses. Senior staff in these institutions individually or in collaboration with staff from academic institutions, have been supervising postgraduate students	<ul style="list-style-type: none"> <li>▪ Contributing data and information on artisanal and subsistence fisheries to ASCLME Programme</li> <li>▪ Participate in the institutional and individual capacity building for LME assessments, information management and other related disciplines</li> <li>▪ Researchers and students participate in the cruises</li> </ul>
National Oceanographic Data Centres	Through the support provided by the ODINAFRICA project, National Oceanographic Data Centres have been established in the countries that did have them. The NODC are implementing the following activities: <ul style="list-style-type: none"> <li>○ Provision of data locator services</li> <li>○ Development and maintenance of national marine metadata-bases</li> <li>○ Development of national marine atlases</li> </ul> For South Africa, physical oceanographic data are held at the Southern African Data Centre for Oceanography (SADCO)	<ul style="list-style-type: none"> <li>▪ These NODCs could act as information focal points for the Programme</li> <li>▪ Most of the NODCs have GIS facilities and they could be involved in the outputs/activities 2.3 Increased systems knowledge through use of GIS and predictive models</li> </ul>
Centre National de Données et d'Information Océanographiques des Comores (CNDOC)	The CNDOC offers a central point for the coordination of oceanic research activities in the Comoros. It works closely with the Fisheries Department, the Department of the Environment, the Metrological Services,	<ul style="list-style-type: none"> <li>▪ Potential users of the information relevant to Comoros generated by ASCLME Programme</li> </ul>
The Coastal Development Authority (CDA)	CDA is a corporate body, which is required to plan, initiate, coordinate and monitor development activities within the administrative districts of Coast Province and Kenya's	<ul style="list-style-type: none"> <li>▪ Potential users of the information relevant to Kenya's EEZ generated by ASCLME</li> </ul>



	Exclusive Economic Zone. More specifically, it is responsible for the exploration and development of fishing and marine activities in the EEZ	Programme
Centre for the Sustainable Development of Coastal Zones (CDS-CZ)	The Centre will act as the technical arm of the Ministry for the Coordination of Environmental Affairs (MICOA), concentrating on planning, training, awareness, education, monitoring, research and data storage.	<ul style="list-style-type: none"> <li>▪ Potential users of the information relevant to Mozambique generated by ASCLME Programme</li> </ul>
The National Research Foundation (NRF) of South Africa	NRF supports and promotes research through funding, human resource development and the provision of necessary research facilities. It is a mechanism through which most of the South African researchers receive their funding	<ul style="list-style-type: none"> <li>▪ Potential co-funding source particularly for the participating South African scientists</li> </ul>
The Mbegani Fisheries Development Centre	<p>The Mbegani Fisheries Development Centre provides technical training for Fisheries Officers, Fishermen, Marine Engineers, Boat Builders, and Reserve Managers and Guides. The centre has its own vessel for practical sea training. The Centre hosts the Marine Compliance and Surveillance (MCS) operations room for Tanzania. All MCS operations in the country's waters are coordinated from this operations room.</p> <p>It is recognized by SADC as a regional training centre.</p>	<ul style="list-style-type: none"> <li>▪ Potential users of the information generated from the Programme</li> <li>▪ Its research vessel, <i>R.V. Mafunzo</i> could be used for the Programme's research activities</li> </ul>
<b>NATIONAL LOCAL NGOS/PROGRAMMES</b>		
SAGE, Madagascar	SAGE is involved in the local management of renewable natural resources (forest, rangeland, and marine and coastal zones). The main role of SAGE is to help local communities, by improving their ability to manage resources (GELOSE) and to assist ANGAP in involving communities in the design and implementing of protected area management plans.	<ul style="list-style-type: none"> <li>▪ Act as a link between the national institutions working in the ASCLME Programme and the communities</li> <li>▪ Contributing data and information on artisanal and subsistence fisheries to ASCLME Programme</li> </ul>
ARVAM, La Reunion	ARVAM is a regional centre of excellence in various fields such as coral reef monitoring (use of GIS, data base, satellite images), mapping marine and coastal ecosystems (including vulnerable sites), biodiversity inventory, ecotoxicology.	<ul style="list-style-type: none"> <li>▪ Act as a link between the national institutions working in the ASCLME Programme and the communities</li> </ul>
Parc Marin. La Reunion	Parc Marin is an association working for the protection of the coral reefs of the southwest coast. Its main tasks concern: environmental education, ecotourism, infrastructure development, biodiversity surveying and assessment, coral reef monitoring, surveillance (it employs six eco-guards) management and local participation.	<ul style="list-style-type: none"> <li>▪ Act as a link between the national institutions working in the ASCLME Programme and their membership</li> </ul>

National NGOs in Seychelles	<p>Nature Seychelles – responsible for management and restoration of the Cousin Island and engaged in bird conservation activities</p> <p>The Nature Protection Trust of Seychelles - responsible for management of Silhouette Island and research on tortoises and birds.</p> <p>The Seychelles Island Foundation - responsible for management of the Aldabra and Valle de Mai World Heritage sites as well as research and conservation of birds, giant tortoises and the Coco-de-mer</p>	<ul style="list-style-type: none"> <li>▪ Contributing data and information on seabirds to ASCLME Programme</li> </ul>
South African Association for Marine Biological Research (SAAMBR)	<p>SAAMBR is a non-governmental organization that was established to stimulate community awareness of the marine environment through education and promote wise, sustainable use of marine resources through scientific investigation. The SAAMBR is comprised of the following divisions:</p> <ul style="list-style-type: none"> <li>○ The Oceanographic Research Institute (ORI)</li> <li>○ Sea World Aquarium and Dolpinarium</li> <li>○ Sea World Education Centre</li> </ul>	<ul style="list-style-type: none"> <li>▪ Act as a link between the national institutions working in the ASCLME Programme and their membership</li> </ul>
Non-governmental research institutions such as the Oceanographic Research Institute (South Africa)	<p>ORI is the research arm of the SAAMBR, which was established to carry out scientific research into marine and coastal living resources. ORI also functions as a sub-department of the University of Natal, and consequently, be able to supervise postgraduate students admitted at the University. ORI has specialize on the following amongst others:</p> <ul style="list-style-type: none"> <li>○ Quantitative resource assessment, including artisanal, recreational, small and industrial fisheries of southern Africa.</li> <li>○ Long-term monitoring of resource use</li> <li>○ Modeling of resource dynamics and usage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Participate in the institutional and individual capacity building for LME assessments, information management and other related disciplines</li> <li>▪ Researchers and students participate in the cruises</li> </ul>
The South African Network for Coastal and Oceanographic Research (SANCOR)	<p>SANCOR is a non-statutory body that generates and communicates knowledge and advice to promote the wise and informed use and management of marine and coastal resources and environments. It is a body that represents marine scientists, engineers, technologists, institutions, policy-makers and administrators. In addition to providing a forum for promoting interaction and collaboration between its members, SANCOR helps to develop capacity,</p>	<ul style="list-style-type: none"> <li>▪ Act as a link between the national institutions working in the ASCLME Programme and the membership</li> </ul>

	promote the use of coastal research findings. It also acts as a broker between national and international funding agencies and researchers.	
Marine and Coastal Environment Management Programme (MACEMP)	<p>The broad aim of the programme is to strengthen the sustainable management and use of the Exclusive Economic Zone, territorial seas, and coastal resources resulting in enhanced revenue collection, reduced threats to the environment, better livelihoods for participating coastal communities living in the Coastal Districts, and improved institutional arrangements.</p> <p>The Programme has three objectives namely to:</p> <ul style="list-style-type: none"> <li>▪ establish and implement a common governance regime for the EEZ that contributes to the long-term sustainable use and management of EEZ resources;</li> <li>▪ establish and support a comprehensive system of managed marine areas in the territorial seas, building on ICM strategies that empower and benefit coastal communities;</li> <li>▪ empower coastal communities to access opportunities so that they can request, implement and monitor sub-projects that contribute to improved livelihoods and sustainable marine ecosystem management.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential users of the information generated from the Programme</li> <li>▪ Contributing data and information on fisheries in Tanzania waters to ASCLME Programme</li> </ul>
<b>CROSS-CUTTING</b>		
Environmental educators from government institutions and NGOs		<ul style="list-style-type: none"> <li>▪ Participate in the development of networking opportunities between environmental education practitioners, development of resource materials on marine related topics, and the provision of targeted training opportunities for environmental educators</li> <li>▪ Together with other communicators such as journalists, participate in the design and execution of a broad based media outreach</li> </ul>

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**TABLE 3: PARTICIPATION PLAN – PRODUCTS, TARGETS AND PROJECTED BUDGET**

Output	Activity	Product	Target	Budget (US\$)
PP Project	Facilitation and coordination of PP activities in the region	Coordination of activities in each country	6 months from project start	250,000
	Meetings and workshops	Documentation and plans for PP in the region	6 months from start of project and annually	80,000
	Stakeholder consultations	Workshop/meeting proceedings and documents	7 months from start of project and annually	80,000
	Documentation of existing courses and EE Programmes/projects	Report and database	End 2006	16,000
Networking	Stakeholder analysis	Stakeholders list		16,000
	Creation of ICT tool & Knowledge Management	DLIST	18 months from start of project	122,000 72,000
	Stakeholder communication	Website contributions; newsletter (print); media releases (print, TV); public presentations	Ongoing Bi-annually Ongoing Ongoing	40,000
	Capacity building	Support structures for education and public awareness practitioners Annual meeting of coordinators	1 year from start will there be support structures and ongoing contributions First one 6 months from start of project then annually	40,000
	Representation at different networks and forums	Conference presentations and contributions to meetings	Ongoing, at least 2 annual international/regional conferences/meetings	80,000
Product development	Creation and documentation of short films and television Programme inserts	Films <ul style="list-style-type: none"> <li>• Educational</li> <li>• public interest</li> </ul>	2 annually from 2007 – 2009 4 annually from 2006 – 2008	95,000 150,000
	Development, documentation and showing of environmental theatre	Environmental theatre piece	12 month from start of project and updated annually till 2008	120,000
	Creation and documentation of distance course	Courses on coastal zone management	9 months after the start of the DLIST website	100,000
	Creation and documentation of EE school based materials	Books, CD-ROMs for schools based education	Annually 2 products developed in each country from 2007 till 2009	500,000

<b>Output</b>	<b>Activity</b>	<b>Product</b>	<b>Target</b>	<b>Budget (US\$)</b>
	Creation of display material and development of a culture of expositions	Models	6 models per country 2 years from project	50,000
	Creation and distribution of interpretive signage and posters	Posters	9 per country start 8 months from project start, 4 per country annually from 2007 till 2009	61,000
	Creation and documentation of field guides	Field/sampling guides	2 from 2007 till 2009	60,000
Training	Presentation of Coastal Zone course	DLIST course trainees/graduates	From 2007 -	Course fee
	Educator training	trainees	10 000 till 2009	120,000
	Supervising and mentoring graduates	MED graduates PhD graduates Environmental Education certificate holders	8 at the end of 2009 4 at the end of 2009 20 at the end of 2009	80,000 40,000 78,000
	Experiential educator training	Educators exposed to first hand ocean research	45 by the end of 2009	160,000
Public Participation and Awareness	Experiential learning	Learners exposed to research vessels through on-board visits	4000 by the end of 2009	155,000
	Communication	Articles, newsletters, public workshops, community presentations	Widespread through out the life of the project	120,000
	Information sharing	DLIST outreach component	After completion of course development and initial tool development	100,000
		DLIST Maintenance	2007-2010 Ongoing (post 2010)	300,000 120,000
		Informed stakeholders	2 annual events	80,000
		Community aware of marine environment	2 annual events	105,000
		School outreach		

## ANNEX 16: PROGRAMME COORDINATION PLAN

### ASCLMEs Programme Coordination Plan

#### Key Elements/Principles

**Programme Coordination Committee (PCC).** The three projects will form a Programme Coordination Committee (PCC). The PCC would be comprised of members from each of the projects. Each of the projects within the Programmatic approach would be represented on the PCC by the respective task team leaders for the IAs, Project Managers (in the case of WIO-LaB and ASCLME) / Project Coordinator (in the case of SWIOFP), and two members from each of the respective Project Steering Committees. The PCC would meet not less than once annually, and will meet at the call of any of the project managers/coordinator. The PCC would focus specifically on the TDAs/SAPs development process, but will also discuss other issues such as data management, capacity building and stakeholder involvement, LME module coverage, donor recruitment and other issues to ensure long-term Programme sustainability. To assure maximum possible cooperation and creation of synergies, the Africa Coelacanth Ecosystem Programme (ACEP) would also serve as a member of the PCC.

**Alignment of workplans.** The projects will seek alignment of workplans in order to create synergy and efficiency in implementation. This alignment concerns in particular, although not exclusively, issues such as the TDA/SAP process and the joint cruises by ASCLMEs and SWIOFP. Alignment of workplans will occur through the annual Programme Coordination Meetings (PCM), through participation in each others Steering Committee meetings, as well as through additional meetings (e.g. the SWIOFP annual workplan sessions) and other ways of interaction as needed.

**National-level implementation and coordination.** The existing implementation capacity at national level differs from country to country, but is generally inadequate. Effective implementation and coordination of activities ‘on the ground’, in particular during the TDAs/SAPs process, requires considerable national and regional capacity. For reasons of efficiency, a joint national coordination mechanism for the implementation and coordination of the TDAs/SAPs processes will be agreed upon by the Project managers/coordinators, including support for workspace and running costs, human resources and the establishment and operation of inter-ministerial committees. The exact modalities of these mechanisms may differ from country to country, depending on need (existing capacity) and government frameworks.

**LME approach.** The projects within the Programme have also been analyzed in relation to the overall “fit” of all activities of the three projects, and in relation to specific modules of the LME approach to management (See Annex 1). Together, a programme level objective of the projects is to address all aspects of the LME approach. The annual planning sessions will serve as milestones for the analysis, and if needed, adjustment of the respective project-level workplans and activities in order to fulfill this objective. Table 1 below depicts the linkages between the LME modules and project responsibilities with regard to each.

**Cruise coordination.** ASCLMEs and SWIOFP will be organizing joint cruises and data collection. Coordination of these cruises requires close cooperation by the two projects, and while linkages between the two Projects in the area of cruise cooperation was begun during preparation, the Projects are committed to further, intensive discussions immediately upon implementation to create maximum synergies through careful and joint definition of detailed cruise plans. The WIO-

LaB Project will also work collaboratively with the ASCLMEs Project to create synergies in near-shore areas of the ASCLMEs, and discussions to effect close cooperation have already begun. Day-to-day responsibility for SWIOFP/ASCLMEs Project sponsored cruises will be the responsibility of a Cruise Coordinator, financed by and housed in the SWIOFP offices but considered an officer at Programme level. The Programme Coordination Committee will also be called upon to assure continuing discussion and cooperation to create maximum cross-Project synergies and assure coordination with other countries that are undertaking related cruises in the ASCLMEs region.

**Data management.** There are at present already a considerable number of GIS-based database systems operational for the region. Databases include the IOC-UNESCO ODINAfrica database (at present primarily oriented at oceanographic data), the UNEP supported Eastern-Africa Coastal and Marine Database (primarily based upon land-based and coastal data), the FAO managed Tuna Database (under development), the ACEP Marine Resources Database as well as many other regional and national database systems. The three projects have individually made provision for the establishment of (GIS-based) database systems. Accordingly, the three projects will seek synergy both within the framework of the ASCLMEs Programme and beyond, again utilizing the Programme Coordinating Committee as the vehicle for cross-Project communication and coordination and coordination with other organizations involved in data collection, management, and storage the ASCLMEs region.

**Capacity building and public participation.** In view of the broad ASCLMEs Programme context, a lot of synergy may be found in terms of capacity building and public participation activities. The three projects will therefore jointly plan and undertake such activities if and when appropriate. More specifically, within ninety days of start of ASCLMEs and SWIOFP Project implementation, the three Projects within the Programme, and the ACEP will developed an overall Capacity Building Programme to assure maximum coordination and cooperation in the area of capacity building.

**TDAs/SAPs process.** The TDA and SAP<sup>58</sup> processes will be carefully coordinated between the three projects, as they are seen to be the most important product that will come of the programmatic approach. It is recognized that the implementation periods of the three projects do not correspond. In order to fit respective project implementation timeframes, and in particular within the light of the already ongoing WIO-LaB project, the combined workplan for completion should lead to a December 2008 deadline for completion of a preliminary, WIO-LaB specific TDA and SAP<sup>59</sup>. Completion of this first stage will enable detailing and start of SAP implementation activities to be started under the pollution and ecosystem health module. By December 2008, data from cruises and other activities under SWIOFP and ASCLME will largely not yet be available, and thus ecosystem-wide TDAs/SAPs will not be produced until closer to the completion dates of the ASCLMEs and SWIOFP Projects, scheduled for completion in 2011. The 2008 WIO-LaB specific TDA will, however, include an assessment of available data and information pertinent to the ASCLMEs and SWIOFP Projects.

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<sup>58</sup> The 3 GEF Projects within the Programme will produce two TDAs and two SAPs. One TDA and one SAP will be developed for the countries of the ALME; and one TDA and one SAP for the southern reach of the SLME (Tanzania and Kenya), as the coastal areas of Somalia, and Somali near-shore waters are not at this time considered safe areas by the UN for Project and Programme work.

<sup>59</sup> Apart from meeting the WIO-LaB workplan, this target is being set among others to meet the date of the 2009 Ministerial-level Conference of Parties to the Nairobi Convention, which will be used as a modality for ministerial-level endorsement of the (preliminary) TDA/SAP.



Each of the Projects within the Programme will be responsible for developing its portion of the TDAs – the WIO-LaB for land-based activities/sources and their impacts, the SWIOFP for off-shore fisheries, and the ASCLMEs Project for issues related to productivity, oceanography, near-shore fisheries, and socio-economics. The WIO-LaB Project Manager will take responsibility for management of the TDA/SAP process until 2008, at which time the ASCLMEs Project will provide a Coordinator to assume responsibility from thereon. The Coordinators will work through the Programme Coordination Committee as a way of maximizing necessary levels of communication and cooperation among the three Projects. The principal role of the Programme level Coordinators will be to synthesize the various elements of the TDAs being prepared by the Projects under the Programme. The Coordinator will also be responsible for harmonizing efforts in SAPs preparation.

At national level, TDA/SAP committees will be established. These committees will provide country specific inputs to and validate the country level inputs to the TDAs/SAPs. National TDA/SAP committees, and related task forces and work groups, will be comprised of personnel from key ministries and other organizations as deemed necessary by the designated country Lead Agencies. These will comprise at a minimum the focal point institutions of the three projects, expanded with other key stakeholders as necessary. WIO-LaB has already established such national committees for LBA related activities, and these core units will be expanded to encompass the ASCLMEs and SWIOFP projects.

To coordinate the work of the national coordination committees, a secretariat function will be established in the designated focal point institution. The Nairobi Convention NFP Institute could assume this responsibility as they are already mandated as coordination centers on marine and coastal environment issues in the participating countries. Each country would, however, make this determination.

Each national secretariat and its functioning will be supported by the projects as required, and it is expected that secretariat assistance will be negotiated at Programme level with each participating country, as national level resources and needs differ widely among the participating countries.

**TDA/SAP Coordination Timelines.** WIO-LaB will complete the LBA-based TDA and SAP by the end of 2008, and the process of data collection for the TDA (e.g. in terms of data collection and analysis of problems, as well in setting up the coordination structures consisting of regional and national Task Forces and coordination committees), has already begun. Actual TDA/SAP preparation is scheduled to start in January 2007, although a detailed schedule is yet to be devised.

It is necessary to pool TDA and SAP related information from the 3 projects and undertake a synthesis of the pooled information. This process will take place in calendar years 2007-2008, under WIO-LaB auspices. As new TDA/SAP information becomes available through the activities and outputs of the ASCLMEs and SWIOFP projects, in calendar years 2008- 2011, it will be incorporated into the ongoing TDAs/SAPs formulation process. This ongoing process would be coordinated by the ASCLMEs project.

#### **TDA/SAP Coordination Resources**

WIO-LaB TDA/SAP resources total approximately US\$ 240,000. This sum was to be available for the hiring of experts and holding meetings, but excludes inputs from the various technical Task Forces, national stakeholder involvement and coordination activities, and training. Further

to these WIO-LaB allocations, the following inter-project resource distribution arrangements for the TDA/SAP process are foreseen:

- *Costs of TDA/SAP synthesis work (regional and national TDA/SAP Committee meetings and expert fees):* These costs will be shared. ASCLMEs and SWIOFP resource commitments will match those of the WIO-LaB (e.g. around US\$ 240,000, although not necessarily equally shared);
- *Cost of regional coordination:* WIO-LaB will cover the cost of the TDA/SAPs Coordinator for 2007-2008 (basically, WIO-LaB Project Manager). ASCLMEs will cover the cost of the TDAs/SAPs Coordinator thereafter.
- *Data collection and analysis on specific topics:* to be covered by the individual projects (e.g. WIO-LaB for LBAs, SWIOFP for blue-water fisheries, ASCLMEs for oceanography, nearshore fisheries, socio-economics, etc.).
- *Cost of national-level coordination and stakeholder involvement/awareness activities:* WIO-LaB to attribute up to US\$ 160,000 budget for this activity, in the form of support to the national focal point institutions to undertake TDAs/SAPs related activities (subject to agreement by the WIO-LaB PSC), as well as specific awareness raising activities. The SWIOFP will provide support through its national level TDA coordinators, who will be responsible for generating TDA inputs related to the fisheries components of the SWIOFP project, and who will organize and execute national level TDAs and SAPs fisheries related activities. Where possible, fisheries related TDA meetings will be held jointly with TDA related activities of the other two projects, making such meetings, effectively, programme level TDA meetings. The SWIOFP TDA coordinators are funded as part of Component 7 as described in the SWIOFP Project Appraisal document. The ASCLMEs project will provide an indicative amount of up to US\$ 400,000 for these activities, the final amount to be determined after development of specific, annual TDA workplans undertaken by the Programme Coordination Committee.
- *Costs of training of the respective TDA/SAP committee members:* These will be covered by the respective projects. WIO-LaB, ASCLMEs and SWIOFP will reserve budget for TDA/SAP training of key persons to be involved in the process on the part of their respective projects, but the training programme itself will be jointly conceptualized and organized through auspices of the Programme Coordination Committee.

A more detailed summary of costs related to programme level activities for the ASCLMEs, including those related to TDAs/SAPs preparation appears in Table 2 below.

### **Key Linkages to Regional Organizations**

The Projects under the Programme would look to the NEPAD and, more specifically, to the Nairobi Convention to assist in gathering high-level governmental support necessary for endorsement of, and the securing of high-level political support necessary to SAPs implementation. Involvement of the NEPAD and the Nairobi Convention must be secured from the start of implementation of the respective Projects under the Programme, and indeed the involvement of the Nairobi Convention has already been secured by the WIO-LaB Project which is already under implementation. The involvement of the NEPAD and Nairobi Convention is also facilitated by inclusion of their representatives on the Steering Committee of the ASCLMEs

Project. In summary, securing early and consistent involvement of the NEPAD and the Nairobi Convention will be an important priority for the Coordinator.

**TABLE 1 – TDAs/SAPs Project and Programme Coordination**

Issue	Mechanism	Responsibility	Timing	Budget (000's USD)
<b>Alignment of workplans</b>	Yearly programme coordination meetings (or upon requirement)	Rotational hosting by the three projects	Annual	Total: 60 ASCLMEs: 20 WIO-LaB: 20 SWIOFP: 20
<b>National-level implementation</b>	National coordination for TDA/SAP process (according to clear TOR): <ul style="list-style-type: none"> <li>○ Workspace</li> <li>○ HR</li> <li>○ Inter-Ministerial Committees</li> </ul>	WIO-LaB to manage/administer	Continuous	Total: 760 ASCLME: 500 WIO-LaB: 160 SWIOFP: 100
<b>TDA</b>	Joint exercise based upon the following principles: <ul style="list-style-type: none"> <li>• Data collection, analysis per theme</li> <li>• Coordinated synthesis</li> <li>• Modular approach</li> <li>• Joint national coordination mechanism</li> </ul>	Inputs from all three projects (per theme). Coordination during stage 1 (2006-2008): WIO-LaB; stage 2 (2009-2010): ASCLMEs Project.	Need flexibility to accommodate respective workplans. Objective: preliminary TDA by December 2008 (probably with gaps in fisheries, productivity, and oceanographic data).	Total: 520 ASCLME: 300 WIO-LaB: 120 SWIOFP: 100 (exclusively process-related funds and transaction costs. Data collection and analysis covered under different components)
<b>SAP</b>	Joint exercise based upon the following principles: <ul style="list-style-type: none"> <li>• Joint national coordination mechanism</li> <li>• Ministerial-level meeting by mid-2009 (1)</li> <li>• Regional higher-management intergovernmental</li> </ul>	Inter-ministerial meeting: WIO-LaB; Regional higher-management inter-governmental meetings: ASCLME/WIO-LaB/SWIOFP; Regional-level stakeholder meetings: ASCLME/WIO-LaB; Key	Need flexibility to accommodate respective workplans. Objective: Endorsement of (preliminary) SAP by mid 2009.	Total: 520 ASCLME: 300 WIO-LaB: 120 SWIOFP: 100

	<p>meetings (2)</p> <ul style="list-style-type: none"> <li>Regional-level broad stakeholder meetings (1)</li> </ul>	<p>roles to be played by NEPAD and, more specifically, the Nairobi Convention.</p>		
<b>Cruise coordination</b>	<p>Cruise coordination committee (meeting as needed)</p>	<p>SWIOFP to manage joint SWIOFP/ASCLMEs cruises through Cruise Coordinator and Cruise Coordination Committee.</p>	<p>Continuous</p>	<p>Total: 600 ASCLME: 75 WIO-LaB: 25 SWIOFP: 500</p>
<b>Data management</b>	<p>WIO-LaB/ASCLME/ODINAfrica/SWIOFP coordinated system</p>	<p>WIO-LaB to explore setup in consultation with other partners. PCC to manage during implementation and assure close coordination with ACEP. ACEP to be represented on the PCC.</p>	<p>Continuous</p>	<p>Total: ASCLME: 1,000 WIO-LaB: 170 SWIOFP: TBD</p>
<b>Capacity building</b>	<p>Coordinated capacity building plan to be jointly developed during early project stages (within 90 days of SWIOFP and ASCLMEs Project implementation.</p>	<p>PCC to manage and, to assure close coordination with ACEP, ACEP to be represented on the PCC.</p>	<p>Continuous</p>	<p>Total: ASCLME: 900 WIO-LaB: 400 SWIOFP: TBD</p>
<b>Stakeholder participation</b>	<p>Joint planning under auspices of the PCC. ACEP efforts to be closely coordinated with those of the Programme through ACEP membership on PCC.</p>	<p>ASCLMEs Project. Coordination to be assured by a Communications Officer to be financed by and housed in office of ASCLMEs Project.</p>	<p>Continuous</p>	<p>Total: ASCLME: 1,500 WIO-LaB: 330 SWIOFP: 100</p>

**TABLE 2: LINKAGES BETWEEN LME MODULES AND PROJECT RESPONSIBILITIES**

Module	Description	Project Responsibility	Role of ASCLMEs Project
Productivity	Identification of productivity hotspots, trophic relationships, temporal variability, riverine and upwelling inputs, toxic tides and algal blooms, inter and intra systemic linkages, roles of gyres and eddies, and monsoon and atmospheric conditions.	This will be addressed under the ASCLMEs Project.	The ASCLMEs Project through cruises and the purchase of state of the art measuring devices will map productivity hotspots, gather necessary information to gauge temporal variability, and gain understanding of the inter and intra-systemic linkages as needed to inform management decisions at regional level.
Fish and Fisheries	Larval transport, trophic relationships, fishery interdependent surveys, systems functioning and relationship to fisheries, industrial fisheries and their relationship to artisanal and subsistence fisheries, the impact of fisheries on biodiversity, the value of non-consumptive use and the interface with consumptive use, and commercial and subsistence landings and effort.	Implementation of the activities will be shared among the SWIOFP (industrial fisheries), ASCLMEs (artisanal and subsistence fisheries) and WIO-LaB projects.	ASCLMEs Project will contribute information to the SWIOFP project on the issue of larval transport in key currents.
Pollution and Ecosystem Health	Identification of anthropogenic threats, natural perturbation, and the conjunction effects of anthropogenic threats and natural perturbation that relate to ecosystem health.	WIO-LaB project with support from ASCLMEs project (Heavy metals and POPs).	The ASCLMEs Project will address issues of pollution through assessment of heavy metal and POPs concentrations in key indicator species. It will also assist WIO-LaB, through cruises, in assessing pollution from land-based sources.
Socio-economic Module	Integrated assessments of human forcing at the LME level and attainment of long-term socio-economic benefits, tasks that are integrated into the outcomes and activities of each of the projects within the PA.	The ASCLMEs and WIO-LaB projects both have activities that address this module, including key elements of the TDA/SAP process and looking at economic benefits at the community level.	The ASCLMEs Project public participation Outcome will involve stakeholders in dialogue about measures to sustain livelihoods while sustaining the long-term productivity of marine resources.
Governance Module	Addresses Regional Governance issues including institutional development, regional and national level capacity building, stakeholder participation, and adaptive management strategies.	This module is also incorporated across the range of outcomes and activities of the three projects, particularly through the TDA/SAP process and associated governance reforms emerging from the SAP.	The ASCLMEs Project will convene representatives of the projects of the Programme, governments, regional organizations and other stakeholders as appropriate to agree on cooperative governance systems for management, as part of the process of finalizing the SAP.

## ANNEX 17: PROJECT TERMS OF REFERENCE

### **The Project Steering Committee**

#### **Context:**

Project funds will be administered as per the Standard Basic Assistance Agreement between UNDP and the Programme countries, which govern the use of UNDP funds. UNDP maintains accountability for the administration of project funds.

#### **General Responsibility:**

The PSC will serve in an advisory capacity. UNDP will ordinarily act on PSC recommendations, but will apply due discretion, as needed to ensure compliance with operational rules and procedures of the Executive Board of UNDP, and to maintain accountability to the GEF Executive Council.

#### **The Project Steering Committee will have 14 Permanent Members, as follows:**

- One representative from each GEF eligible participating country: Comoros, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, South Africa, Tanzania
- One Representative from ACEP
- One representative from UNDP;
- One representative from NEPAD;
- One representative from UNDP-GEF;
- One representative from UNOPS;
- One representative from the Nairobi Convention

#### **The PSC will also include members with observer status, such as:**

- Donor agencies providing co-financing (France, Norway)
- Technical agencies (NOAA)
- Project Managers for WIOLAB/SWIOFP
- Relevant representatives of the Private Sector and NGOs may be invited to attend PSC meetings whenever required

#### **Steering Committee Rules of Procedure:**

- (i) The Project Steering Committee will be chaired on a rotational basis by country representatives.
- (ii) The PSC will meet at least once annually and more frequently if considered necessary.
- (iii) Meetings of the PSC will rotate between the participating countries, taking into account logistical and resource considerations.
- (iv) The PSC will make decisions as far as possible through a consensus. Permanent members of the steering committee will have voting rights, should voting be exercised.
- (v) The PSC will delegate representatives to sit on selection panels for consultants and service vendors, if requested by UNDP.
- (vi) The fixed minimum number of members necessary to make a quorum is 8.
- (vii) Permanent members of the PSC will appoint an alternate to attend PSC meetings, in the event that the designated representative is unable to attend.
- (viii) An Annual Tripartite Review of the project will be chaired by UNDP, as part of a regular PSC meeting. The TPR will approve the Annual Project Review (APR) and Work Plan

**The Specific Functions of the PSC shall be to:**

- review and recommend approval of Annual Work Plans;
- monitor progress in project implementation against agreed Outcomes and Outputs
- provide strategic guidance, to ensure the timely and cost effective realization of project objectives;
- validate Project Outputs, including the Transboundary Diagnostic Analysis Study, Strategic Action Programme and other documents;
- resolve conflicts and problem areas as needed to facilitate project delivery; and
- ensure that country commitments, including of co-financing, technical and operational support are met.

As the PSC represents the senior decision-making body for the project it will not expected to deal with day-to-day management and administration of the project. This will be handled by the Project Manager (PM), and in coordination with the Executing Agency.



## **Project Coordination Unit**

### **Location:**

Port Elizabeth, South Africa

### **Background:**

The PCU will provide a coordination and management structure for implementation of the UNDP-GEF ASCLMEs Project in accordance with the rules and procedures of UNDP as executed through the UNOPS, under the day-to-day direction of the Project Manager, and based on the general guidance provided by the Project Steering Committee (PSC). The PCU is comprised of the Project Manager, Science Programme Coordinator, Communications Director, Finance and Administration Officer, Administrative Assistant, Secretarial assistance, and local and international consultants as may be required.

### **Tasks:**

- Assistance in networking between and among project entities such as the PSC, national officials (all participating countries), Implementing Agency personnel, cooperating partners such as FAO, BENEFIT, UNDP Country Offices, National Focal Points, existing and potential co-financers, other related GEF projects, and others as appropriate and necessary;
- Organization of technical cooperation activities and general coordination between and among the various Projects that are part of the GEF ASLME Programme, creation and coordination of capacity-building activities, management and donor activities;
- Organization of project related consultative meetings for introducing and implementing the project and, as necessary, programme activities (including arrangements for such necessities as simultaneous translation and the production of documents in various languages as may be necessary);
- Collection and dissemination of information on policy, economic, scientific and technical issues related to the ASCLMES Project and, as necessary the ASLME Programme;
- Preparation of progress reports (administrative and financial) concerning program activities and outputs;
- Preparation and arrangements for hosting annual TPR Review Meetings;
- Establishment of and assistance in networking between specialized institutions in participating countries and technical specialists from elsewhere; and
- Program management (financial, logistical and strategic).

## **Project Manager**

### **Location:**

Offices of the Programme Coordination Unit, Port Elizabeth, South Africa, and travel in the project region as necessary, and travel to regional and other International locations consistent with these Terms of Reference.

### **Background:**

The PCU will provide a coordination and management structure for implementation of the UNDP-GEF Project in accordance with the rules and procedures of UNDP as executed through the UNOPS, under the day-to-day direction of the Project Manager, and based on the general guidance provided by the Project Steering Committee (PSC). The PCU is composed of the Project Manager, Science Programme Coordinator, Communications Director, Finance and Administration Officer, Administrative Assistant, Secretarial assistance, and local and international consultants as may be required.

### **General Responsibilities:**

The Project Manager (PM) shall be responsible for the overall coordination of all aspects of the UNDP-GEF ASCLMEs Project, in general and in particular. He/she shall liaise directly with designated officials of the Participating Countries, other Members of the PSC, the Implementing Agency, the Executing Agency, UNDP Country Offices, existing and potential additional project donors, National Focal Points, and others as deemed appropriate and necessary by the PSC or by the PM him/her self. The budget and associated work plan will provide guidance on the day-to-day implementation of the approved Project Document and on the integration of the various donor funded parallel initiatives. He/she shall be responsible for delivery of all substantive, managerial and financial reports from and on behalf of the Project. He/she will provide overall supervision for all GEF staff in the Program Coordination Unit, as well as guiding and supervising all external policy relations, especially those related to other Projects within the ASLME Programme.

### **Specific Duties:**

The PM will have the following specific duties:

- Manage the GEF Components of the PCU, its staff, budget and imprest fund;
- Prepare an Annual Work Plan of the program on the basis of the Project Document, under the general supervision of the Project Steering Committee and in close consultation and coordination with related Projects in the ASCLMEs Programme (WIO-LaB and SWIOFP), the ACEP, National Focal Points, GEF Partners and relevant donors;
- Coordinate and monitor the activities described in the work plan;
- Direct the project monitoring and evaluation processes including the regional and demonstration components, and the design of the replication strategy to be developed from the demonstration projects;
- Oversee the development of information management tools to ensure evaluation, monitoring and replication activities;
- Ensure project compliance with all UN and GEF policies, regulations and procedures;
- Ensure consistency between the various program elements and related activities provided or funded by other donor organizations;
- Assure preparation of Terms of Reference for consultants and contractors;

- Coordinate and oversee preparation of the substantive and operational reports from the Program;
- Foster and establish close linkages with the other Projects within the GEF ASCLMEs Programme, with other related GEF programs, the ACEP and, where appropriate, other relevant regional International Waters and related programs and projects within and outside of the region;
- Represent the Project at meetings and other project related for a within the region and globally, as required; and
- Submit quarterly reports of relevant project progress and problems to the PSC.

**Qualifications:**

- Post-graduate degree in the Marine Sciences, Environmental Management, or a directly related field (e.g. fisheries management, natural resources economics, etc.);
- At least fifteen years experience in fields related to the assignment;
- Demonstrated diplomatic and negotiating skills;
- Familiarity with the goals and procedures of international organizations, in particular those of the GEF and its partners (UNDP, UNEP, the World Bank, and regional organizations related to Project and Programme activities, and currently identified Project and Programme donors);
- Excellent English speaking and writing skills;
- Previous work experience in one or more of the participating countries, and previous work experience in the region on issues related to the Project and Programme will be very favorably considered; and
- Working knowledge of French and/or Portuguese, and Kiswahili and Zulu highly advantageous.

## **Science Programme Coordinator**

### **Duration:**

One-Year, Renewable and travel in the project region as necessary, and travel to regional and other International locations as may be directed by the Project Manager.

### **Location:**

Offices of the Programme Coordination Unit, Port Elizabeth, South Africa.

### **Background:**

The PCU will provide a coordination and management structure for implementation of the UNDP-GEF Project in accordance with the rules and procedures of UNDP as executed through the UNOPS, under the day-to-day direction of the Project Manager, and based on the general guidance provided by the Project Steering Committee (PSC). The PCU is composed of the Project Manager, Science Programme Coordinator, Communications Director, Finance and Administration Officer, Administrative Assistant, Secretarial assistance, and local and international consultants as may be required.

### **General Description:**

The Science Programme Coordinator is responsible for coordination of and providing input to the many scientific issues that will be addressed within the activities of the ASCLMEs Project and the ASCLMEs Programme. He/she will be charged with maintaining close and continuing contact with scientific and technical level staff and consultants of the ASCLMEs Project and the related Projects under the overall ASCLMEs Programme, specifically the UNEP implemented West Indian Ocean Land-based Sources of Pollution Project (WIO-LaB) and the World Bank implemented Southwest Indian Ocean Fisheries Project (SWIOFP), and the ACEP. He/she will also have overall responsibility for coordinating the efforts of the Programme level Science Review Panel, and shall serve as its Secretary. He/She will also be responsible for assuring the timely delivery of the two TDAs and SAPs that are a critical activity at both project and programme level, and shall serve as a principal source of scientific expertise to the three Projects within the Programme on matters of science related to TDAs and SAPs development.

### **Duties and Responsibilities:**

- Serve as the principal source of scientific advice to the Project Manager and to the Project Steering Committee of the ASCLMEs Project;
- Coordinate the activities of and assume the Secretariat responsibility for the Programme level Science Review Panel;
- Provide science based advice to the ASCLMEs Project Manager and other staff and consultants employed by the ASCLMEs Project;
- Provide science based advice to the other Projects within the Programme at the request of the Project Managers of the WIO-LaB or SWIOFP Projects and, at the request of the Project Manager, through active involvement with the Programme Coordination Committee;
- At the direction of the Project Manager, assist in preparation of Terms of Reference for consultants and contractors;
- Support the Project Manager in liaising with other Projects within the ASCLMEs Programme (WIO-LaB and SWIOFP) and other entities as may be required for the successful implementation of Project activities;
- Assist the Project Manager in developing the annual Work Plan for the project;

- Assume responsibility for the ASCLMEs contributions to the TDAs and SAPs that are to be developed on behalf of the Programme;
- Assume primary responsibility for finalization of the TDAs and SAPs consistent with the obligations of the ASCLMEs Project;
- At the direction of the Project Manager, take the lead in or assist in drafting scientific and technical reports as may be required;
- Generally, foster and establish close linkages with the other Projects within the GEF ASCLMEs Programme, with other related GEF programs and, where appropriate, other relevant regional International Waters and related programs and projects within and outside of the region; and
- At the direction of the Project Manager, represent the Project at meetings and other Project related fora within the region and globally.

**Qualifications:**

- Post-graduate degree in the Marine Sciences or a directly related, scientific discipline (e.g. fisheries management, oceanography, chemistry, geography, biology, etc.);
- At least ten years experience in fields related to the assignment;
- Previous experience in working in collegial settings;
- Demonstrated diplomatic and negotiating skills;
- Familiarity with the goals and procedures of international organizations, in particular those of the GEF and its partners (UNDP, UNEP, the World Bank, and regional organizations related to Project and Programme activities, and currently identified Project and Programme donors);
- Excellent English speaking and writing skills;
- Previous work experience in one or more of the participating countries;
- Previous work experience in the region on issues related to the Project and Programme will be very favorably considered; and
- Working knowledge of French and/or Portuguese, and Kiswahili and Zulu highly advantageous.

## **Communications Director**

### **Duration:**

One-Year, Renewable, and travel in the project region as necessary, and travel to regional and other International locations as may be directed by the Project Manager.

### **Location:**

Offices of the Programme Coordination Unit, Port Elizabeth, South Africa

### **Background:**

The PCU will provide a coordination and management structure for implementation of the UNDP-GEF Project in accordance with the rules and procedures of UNDP as executed through the UNOPS, under the day-to-day direction of the Project Manager, and based on the general guidance provided by the Project Steering Committee (PSC). The PCU is composed of the Project Manager, Science Programme Coordinator, Communications Director, Finance and Administration Officer, Administrative Assistant, Secretarial assistance, and local and international consultants as may be required.

### **General Description:**

The Communications Director will be responsible for coordinating the public participation, information and education activities of the Project, and will assist the other two Projects of the ASCLMEs Programme, the WIO-LaB Project implemented by the UNEP and the SWIOFP Project implemented by the World Bank, through coordination of the public participation, information and education activities of the three projects. He/she will also work closely with communications personnel of the ACEP. In addition to working closely with the WIO-LaB and SWIOFP projects and the ACEP, he/she will work closely with institutional focal points, specialized UN Agencies, national and regional organizations, international organizations, and will cooperate and coordinate with, and encourage activities of other donors.

### **Duties and Responsibilities:**

- Coordinate and supervise the ASCLMEs Project public participation and stakeholder activities as described in the Project Document;
- Coordinate the public participation activities of the ASCLMEs Project with those of the WIO-LaB and SWIOFP Projects. the public participation activities of the ASCLMEs Project with those of the (ACEP);
- Assume responsibility for the creation and maintenance of the Project designated website;
- Support the Project Manager in liaising with other Projects within the ASCLMEs Programme (WIO-LaB and SWIOFP), the ACEP, and other entities as may be required for the successful implementation of Project activities;
- Assist the Project Manager in developing the annual Work Plan for the project;
- Work directly with EcoAfrica and the related personnel of the ACEP, and under the supervision of the PM within the Programme Coordination Unit (PCU) of the ASCLMEs Project;
- Liaise with donors, specialized UN Agencies, international NGOs and other organizations involved in public participation and stakeholder involvement activities in the ASCLMEs region and, as necessary, with related international efforts; Coordinate “Clearing house mechanism component” to the benefit of project and related entities at regional and other levels;
- Edit a regular information bulletin on the project;

- Supervise the development of a library for the PCU;
- Organize meetings, workshops and training courses at the regional level;
- Identify in general and supervise the production of relevant publications/information material;
- Assist with the administration of other information-related technical issues where required by the Project Manager; and
- Liaise with the GEF IW:LEARN Project.

**Skills and Experience Required:**

- Post-graduate degree in environmental sciences, education, or related field.
- At least six years experience in the field and at least three years experience in working with or on similar international projects dealing with international scientific/environmental/technology management projects and information exchange;
- Experience in the organization and implementation of stakeholder workshops, and group facilitation expertise;
- Experience with computer data bases, GIS, web site design and information systems;
- Familiarity with the goals and procedures of international organizations, in particular those of GEF partners;
- Experience in training other specialists would be an asset;
- Familiarity with issues being addressed by the Project and the Programme would be advantageous;
- Demonstrated diplomatic and negotiating skills and excellent interpersonal skills with sensitivity to cultural and socio-political issues in the region.
- Working knowledge of French and/or Portuguese, and Kiswahili and Zulu highly advantageous.

## **Administration and Finance Officer**

**Duration:** One Year Term, Renewable

**Location:** Offices of the Project Coordination Unit, Port Elizabeth, South Africa

**Background:** The PCU will provide a coordination and management structure for implementation of the UNDP-GEF Project in accordance with the rules and procedures of UNDP as executed through the UNOPS, under the day-to-day direction of the Project Manager, and based on the general guidance provided by the Project Steering Committee (PSC). The PCU is composed of the Project Manager, Science Programme Coordinator, Communications Director, Finance and Administration Officer, Administrative Assistant, Secretarial assistance, and local and international consultants as may be required.

### **Tasks:**

Under the supervision of the Project Manager, the Administration and Finance Officer will manage the day to day finances and accounting needs of the PCU. His/her responsibility area will cover procurement/contracting of goods and services (including importation, permits, etc.), personnel matters (in close cooperation with the counterpart staff of UNOPS and the UNDP) and record keeping (including computer-based records). The post holder will be responsible for liaising as appropriate with appropriate country personnel, colleagues in the WIO-LaB, SWIOFP, and ACEP Projects, and will, as delegated by the Project Manager, assume other, related tasks. More specifically the Director of Administration and Finance shall:

- Provide assistance to the Project Manager, as directed by the Project Manager, in organizing, coordinating, directing and supervising specified activities under the project;

### **Finance**

- Manage the Project Imprest account; carry out functions of Certifying Officer for the Imprest Account;
- Be responsible for monthly imprest reports and obligation control status reports to UNOPS;
- Review, analyze, monitor and report expenditure against approved budgets and/or authorized expenditures;
- Provide advice and guidance on financial, budgetary, and administrative matters and prepare budget revisions as and when necessary;
- Prepare cash flow forecasts in consultation with the Project Manager;
- Prepare monthly bank reconciliation statements for all Project accounts;
- Prepare quarterly and annual financial statements for the Project;
- Liaise with the UNDP, UNOPS and external auditors as necessary and assist in responding to audit inquiries and financial management letters;
- Monitor performance against agreed financial performance indicators; and
- Prepare financial withdrawal applications and related disbursement schedules.

### **Administration**

- Assist the Project Manager in developing the annual Work Plan for the project;



- Support the Project Manager in liaising with other Projects within the ASCLMEs Programme (WIO-LaB and SWIOFP), the ACEP, and other entities as may be required for the successful implementation of Project activities;
- Organize meetings, workshops and training courses at the regional level;
- Prepare and follow up on the contracts for international, national consultants/subcontractors and support staff;
- Prepare and follow up on bidding documents for local and regional procurement cases;
- Arrange logistic support for different events, including travel arrangements for missions and travels of the project staff;

**Skills and Experience Required:**

- A Master's Degree or equivalent in business administration, accounting or a related field, or equivalent demonstrated experience in financial management of projects;
- Knowledge of financial regulations and procedures, preferably of the UN System and budget keeping for an international project;
- Good organizational, interpersonal and communication skills;
- Familiarity with and, ideally, possessing work experience in the ASCLMEs region;
- Computer proficiency and knowledge of MS Office and Internet applications;
- Fluency in English required, with ability to communicate well in writing; and
- Proficiency in Portuguese and/or French, and Kiswahili and Zulu very favorably considered.

## **Administrative Assistant**

**Duration:** One Year Term, Renewable

**Location:** Port Elizabeth, South Africa

### **General Description:**

Under the supervision of the PM, the Administrative Assistant will manage the day-to-day operations of the PCU, particularly with respect to technical services, staff support, and, with additional contractual support as necessary, assure that necessary financial, procurement (including importation, permits, etc.) and personnel matters are addressed. More specifically the Administrative Assistant shall:

- Generate and maintain a directory of all persons and institutions engaged in work related to the implementation of the project;
- Supervise data exchange and the maintenance of the data communications network between cooperating institutions;
- Prepare internal and external correspondence for the PCU, maintain files and assist in the preparation of documentation for meetings;
- Use the Internet and conduct research on availability of scientific, legal and technical information on topics related to the project implementation at all sites;
- Assist in organizing project activity meetings and participate in the meetings as directed by the PM;
- Co-ordinate and assist in travel arrangements of the PCU staff and field project personnel;
- Prepare press releases, statements and speeches on the project activities;
- Coordinate information flow by processing routine correspondence and responses to project related enquiries and prepare as necessary letters, memoranda, reports, faxes, etc;
- Assure requisite assistance for the organization of the Project Manager's work including making travel arrangements, hotel bookings and preparation of documentation required for missions;
- Assist in setting up of meetings, processing of documents for meetings, agenda preparation, lists of participants and working documents for the meetings, as well as sending out invitations to the meeting participants.
- Provide secretarial servicing through preparation and distribution of minutes/reports as required;
- Establish and maintain an up-to-date and maintain suitable filing system for the office; maintain an up-dated computerized mailing list of supervisor's contacts, focal points, experts and Ministers of Environment and other partners; disseminate public information awareness by distributing public awareness material to national institutions of participating countries;
- Assist in the logistics of arranging international meetings and conferences including assisting participants with travel and accommodation;
- Maintain mailing links with all participating countries and cooperating partners;
- Prepare pre-encumbrance for stock requisitions for the office and ensure adequate supplies at all times; and
- Undertake such other duties as may be assigned by the PM.

**Skills and Experience Required:**

- Higher education (secondary education or equivalent as experience can be considered);
- Experience of work in international organizations/agencies, governmental offices, research or training organizations highly regarded;
- Complete proficiency in English; working knowledge of Portuguese and French a significant advantage;
- Advanced computer skills and knowledge and demonstrated use of various software applications and Internet skills;
- Reliability, initiative, a methodical approach and attention to detail;
- Ability to work under general guidance or independently;
- Willingness to work substantial periods of overtime at short notice;
- Working knowledge of French and Portuguese highly advantageous;
- Proficiency in the use and operation of the computer, including advanced skills in windows and its programmes;
- Ability to plan, co-ordinate and monitor own work plan, have a great sense of accuracy.
- Must have excellent interpersonal, oral and written communication and organizational skills.
- Have client orientation and satisfaction as part of the day to day duties.
- Must have demonstrated ability to work under pressure.
- The creation of managerial and other efficiencies between and among the three (3) Projects of the ASLME Programme, and of the ACEP;
- Scientific questions of concern or of interest to the Projects within the Programme;
- Public participation, involvement, and environmental education activities;
- Communications initiatives including, but not limited to, Project websites, media campaigns, interactive public activities, and other measures as may be determined by the Committee and approved by the three projects of the Programme; and
- The creation of other synergies that will result in project efficiencies to the benefit of the overall Programme and to the participating countries in the Programme.
- Assure, at the request of the PSC, quality control with regards to scientific activities through peer review;
- Make certain that, at the direction of the PSC, scientific activities meet the expectations of as detailed on the Project Document and are to the satisfaction of the participating countries;
- Undertake a mid-term review of the quality of the scientific undertakings of the Project.

**Membership:**

The membership of the Scientific Review Panel shall be comprised of two permanent members of the PSC and one member from the ACEP, and the PSC shall strike sub-committees to undertake specific scientific inquiries upon the recommendation of the two SC permanent members.

## **EcoAfrica**

### **Location:**

Cape Town, South Africa

### **Duration:**

3 Years

### **Specific Responsibilities:**

Eco-Africa will develop a Pilot Distance Learning and Information Sharing Tool (DLIST), fashioned on the model developed for the GEF supported BCLME Programme, with support from IW:LEARN and in close cooperation with the New Partnership for African Development, or NEPAD. More specifically, Eco-Africa will develop a costed Stakeholder Participation Plan that would, during Project implementation, result in, among other things:

- Creation of networking opportunities for, between and among key coastal stakeholders within the region, especially those of the ACEP, thus facilitating broad public participation within Project Activities;
- Development of an internet-mediated learning environment that assists in the formulation of a strategic development plan for the region;
- Creation of an on-going and self sustaining learning and information-sharing tool, and;
- Documented description of the activities undertaken in this Component.

## **ANNEX 18: UNEP PRELIMINARY TDA – ASCLMEs REGION / UNEP IDENTIFIED MAJOR TRANSBOUNDARY ISSUES**

The identification of the major perceived<sup>60</sup> problems and issues (MPPI) is a first step in the TDA process and it constitutes the justification for the subsequent in-depth analyzes. The significance of the perceived issues and problems should be substantiated on scientific, environmental, economic, social, and cultural grounds.

The MPPIs represent the perceptions of the scientific and expert community on the priority environmental issues of the region. The experts may come from the scientific community, the NGO community, government, and other stakeholder groups. However, not all stakeholders were included in the development of these MPPIs. Therefore, a separate stakeholder analysis will be conducted before the finalization of the TDA during the full GEF project.

This section of the TDA analyzes the MPPIs to identify the technical basis supporting or refuting each MPPI as a priority issue in the WIO region. The intent is to provide a technical rationale for prioritizing the MPPIs, to help guide the direction of future interventions to improve the regional environment. It will be of no use to identify major intervention efforts for an MPPI if the technical basis supporting its priority is missing. In such a case, either the MPPI can be dismissed as a non-priority issue, or just as importantly, gaps in knowledge can be identified, and filling the gaps can become the next step towards addressing that particular MPPI.

This section, therefore, relies on the preliminary TDA prepared by the Institute of Marine Sciences, University of Dar es Salaam in 1998, national reports from the participating countries, various technical publications available for the region prepared by UNEP, ACOPS and other organizations. The major sources of information are listed within each individual section as well as in the Bibliography accompanying this TDA.

The Preliminary TDA identified the following list of major perceived problems and issues. It includes four existing problems/issues:

- I. Shortage and contamination of fresh water
- II. Decline in harvests of marine and coastal living resources
- III. Degradation of coastal habitats (mangroves, seagrass beds, and coral reefs), loss of biodiversity.
- IV. Overall water quality decline. Contamination of coastal waters, beaches and living resources.

Below, each of these problems and issues is addressed from a status perspective. It answers the question: what do we know about each problem/issue? What data support the quantification of the extent of the problem/issue? Do the data support these as real problems and issues, or just as perceptions? This analysis took place on a scientific level, including biological, oceanographic, physical, social, and other perspectives on the problem. This is in effect the “status” assessment.

The next step was to perform the causal chain analysis; the major perceived problems and issues were analyzed to determine the primary, secondary and root causes for these problems/issues. Identification of root causes is important because root causes tend to be more systemic and

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<sup>60</sup> "Perceived" is used to include issues which may not have been identified or proved to be major problems as yet due to data gaps or lack of analysis or which are expected to lead to major problems in the future under prevailing conditions.

fundamental contributors to environmental degradation. Interventions and actions directed at the root causes tend to be more sustainable and effective than interventions directed at primary or secondary causes. However, because the linkages between root causes and solutions of the perceived problems are often not clear to policymakers, interventions commonly are mis-directed at primary or secondary causes.

This TDA attempts to clarify the linkages between root causes and perceived problems, to encourage sustainable interventions at this more sustainable level. Fortunately, root causes are common to a number of different perceived problems and issues, so addressing a few root causes may have positive effects on several problems and issues (Table 9).

**Table 9. Root Causes and Major Perceived Problems and Issues**

Root Causes	Perceived Problems			
↓	<b>I. Fresh Water shortage and contamination</b>	II. Decline in harvests of marine and coastal living resources	III. Degradation of coastal habitats (mangroves, seagrass beds, and coral reefs) loss of biodiversity,	IV. Overall water quality decline. Contamination of coastal waters, beaches and living resources.
1. Rapid growth in coastal population and urbanization	√	√	√	√
2. Lack of policies and legal framework	√	√	√	√
3. Inadequate knowledge	√	√	√	√
4. Institutional Weakness	√		√	√
5. Lack of management strategies		√	√	√
6. Inadequate financing mechanisms and support, lack of investments	√		√	√

The TDA summary analysis of the major perceived problems and issues follows.

### **V.1 Fresh water shortage and contamination**

#### **a. Statement of the problem/issue**

Freshwater shortage and the contamination of supplies are the single greatest environmental constraints to economic and social activities in all countries of the region. Fresh water shortage is equally serious in all the countries of the region with widespread environmental and socio-economic impacts. Lack of regional legal agreements and poorly articulated institutions for

implementing effective international river basin management and ground water conservation, are the dominant problems shared by the whole region, with Mozambique being the prominent example including 8 of the 12 downstream parts of the region's international basins.

In the case of the Small Islands Developing States (SIDS), the small physical size and geological nature of many SIDS means that reliable supplies of freshwater can be a major constraints to development. The economic health of the island states of the WIO of regional and intra-regional concern, partly as a result of the expanding tourist trade, the tuna industry, and the fragile nature of the island ecosystems and biodiversity. Water shortage, contamination and saline intrusions are among the main water problems affecting SIDS.

b. Transboundary elements

The major transboundary patterns of the fresh water shortage and contamination can be illustrated as follows:

- The West Indian Ocean region has rivers basins that transcend national boundaries and the inputs from these rivers have long geographic impacts. The negative effects experienced in estuarine and coastal areas are the result of activities carried in upland areas including the landlocked countries.
- Most coastal areas in WIO region are arid; fresh water is therefore a scarce resource. Many of the industries in the region are located in the coastal urban centers, which have limited waste treatment facilities resulting in contamination of freshwater systems. Highly populated urban centers in coastal areas have poor sanitary conditions that result in high contamination of ground water.
- Land and fresh water are limiting resources in the island states. High population density and expanding tourism industry exert high demands on fresh water resulting in depletion of aquifers to levels that allow that the intrusion of salt water. The lack of effective and efficient sewage treatment results in contamination of ground waters.
- Potential conflicts over shared water

c. Environmental impacts

Major environmental impacts of the fresh water shortage include:

- saltwater intrusion
- down stream erosion
- degradation of coastal ecology
- reduction in biodiversity
- reduction of fisheries resources
- decrease of wetlands areas
- reduced capacity to transport sediments
- modification of coastal habitats

Major environmental impacts of the fresh water contamination includes:

- downstream ecological damage
- modification of coastal habitats
- depletion of fish stocks
- loss of biodiversity
- degradation of coastal ecology

d. Socio-economic impacts

The degradation of ground water resources through saline intrusion and contamination has both social and economic implications for the entire population of the coastal region. The major impacts are:

- Lowering of agricultural production
- Shortage of drinking water
- Decline in drinking water quality
- Reduction of hydro-electric power production
- Reduction in industrial production
- Increased cost of alternative water supplies
- Effects on human health
- Increase water intake treatment costs

Socio-economic consequences related to freshwater shortage and contamination are immense but difficult to assess. For instance, the shortage of fresh water, because it causes deterioration of the water quality, has severe implications in the human health. Indeed, most of the causes of death in Mozambique are infectious and parasitic diseases, all associated with hygiene and water quality. Table 10 presents the number of the cases of waterborne diseases recorded in Mozambique. Further, the deterioration of the water quality affects the availability of natural resources (fish, fauna and flora) has implication in the economy, employment facilities and reduces capacity for the local community to meet basic needs (subsistence). It should be pointed out that shrimp fishery is one of the major source of income for the country. The associated destruction of the coastal environment (e.g. erosion) reduces income from the fisheries and tourism.

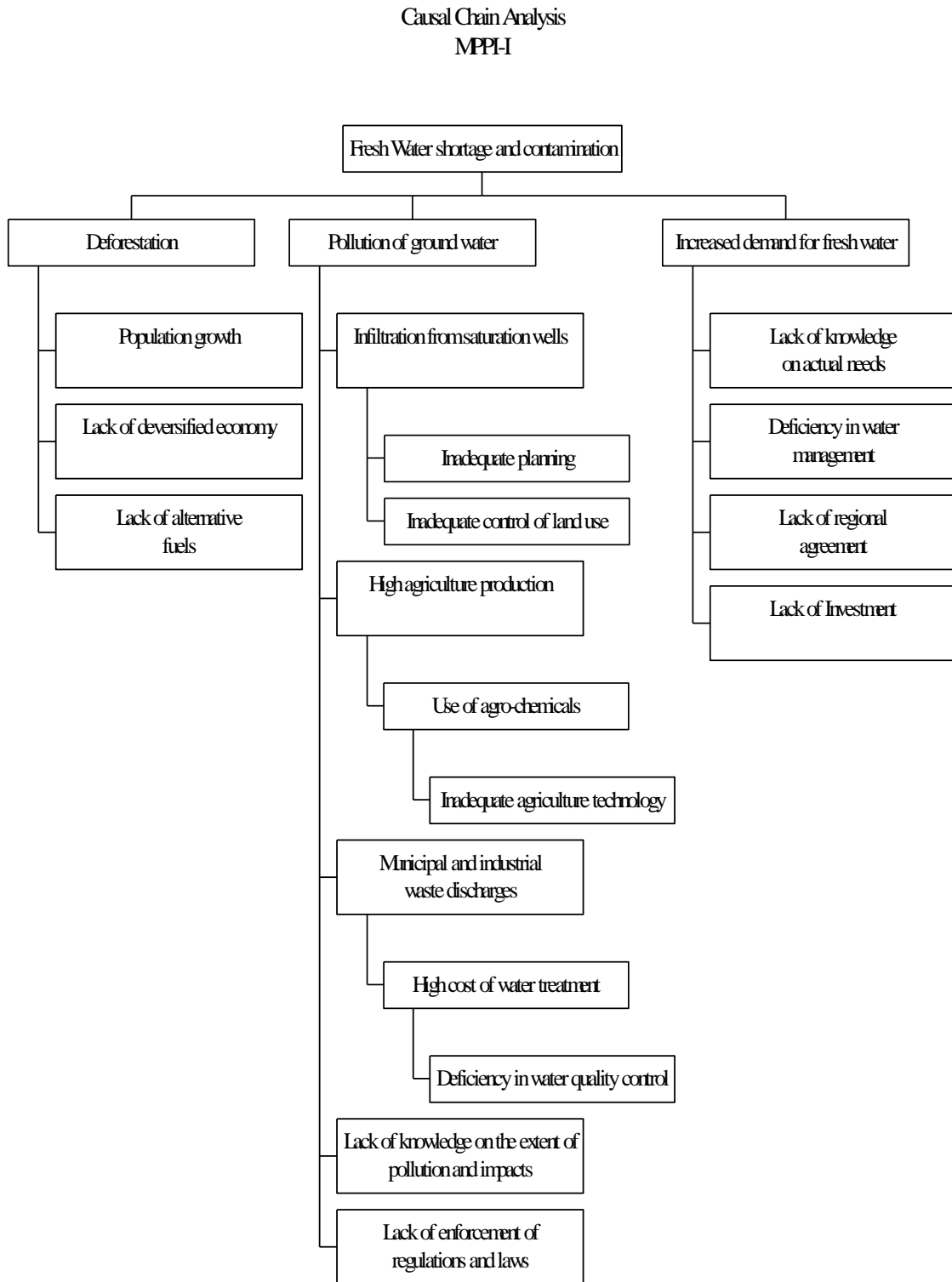


**Table 10. Number of cases of waterborne diseases reported in coastal provinces of Mozambique (Anon, 1998).**

Province	1994			1995		1996	
	Diarrhea	Cholera	Dysentery	Diarrhea	Dysentery	Diarrhea	Dysentery
Maputo	61750	36	19424	50258	9264	50572	7971
Gaza	16909		8854	14463	2661	16966	2188
Inhambane	8509		2118	8904	1496	13966	1802
Sofala	27405	440	3816	38368	5158	35883	6508
Zambézia	46759	1	10287	36319	4982	46197	7874
Nampula	40249	12	6311	29851	4940	20523	3475
C. Delgado	17884	212	9311	10901	3239	17479	4298

e. Causal chain analysis

**Figure 3. Causal Chain Analysis: Fresh water shortage and contamination**



f. Sectors and Stakeholders

Data not available.

g. Supporting Data

By far the largest river in the region is the Zambezi river with the drainage basin estimated at more than one million square kilometers. Other large watersheds include basins of the Limpopo, Juba, Tana and Juba rivers (Table 1).

The coastal regions of the Western Indian Ocean have abundant water resources through rainfall, regional rivers and groundwater. Rainfall is the dominant factor, which determines the overall availability of water available in aquifers and rivers. Due to increase in rural and urban populations and inefficient water supply, the coastal people are increasingly relying on groundwater resources to supplement reticulated water supplies, especially in the cities of Mombasa and Dar es Salaam. In Kenya, many of the middle and higher-class tourist hotels are drilling their own boreholes to augment the reticulated water supply system.

**Table 11. Annual river flows in cubic km, 1995**

Country	Total resource	Annual river flow from other countries	Annual river flow to other countries
Kenya	30.2	10.0	n/a
Madagascar	337.0	0	0
Mauritius	2.2	0	0
Mozambique	208.0	111.0	0
Tanzania	89.0	9.0	n/a

Source: World Resources, 1996-7, World Resources Institute

One of the major problems countries have to contend with is a result of the variation in rainfall over time. In some countries, along the East African Coast, there are long periods of drought interspersed with periods of an overabundance of rainfall (Somalia, Mozambique.) Thus averaged over time water is plentiful but the natural and human engineered capacity for storing water for use through the dry periods is inadequate.

Many projects have been developed along these rivers for hydropower generation, irrigation, of water supply, and in some cases flood control. These projects have modified river flows and have led to increased surface runoff, soil erosion, transport of pollutants downstream, increased industry, agriculture and urban development in certain areas, and changes in water storage patterns of aquifers.

For example in Kenya, some parts of coastline have been developed beyond the capacity of available water resources to supply the demand. This has led to local communities being accorded a lower priority to receive water than hotels and housing developments (Salm, 1998).

The result of these activities resulted in a reduction of the availability of freshwater for various uses. The main issues and problems arise from:

- pollution of water supplies
- lowering of the water table in some areas
- reduction in stream flows of major rivers and streams

In Comoros, only islands Anjouan and Moneli have permanent waterways. The major rivers include Ajano Gege, Trondoni and Tatinga. For the last 50 years the river flow decreased

dramatically. Out of 48 rivers on the Anjouan island, only 11 have a permanent flow through the year.

Mozambique is a country that shares all its main rivers with other countries and is the lowest riparian. The main rivers are, from North to South, Rovuma, Zambezi, Pungoé, Buzi, Save, Limpopo, Incomati, Umbeluzi, and Maputo. They are all international and flow in a NW-SE direction, draining the water into the Indian Ocean. The Rovuma River constitutes the natural border between Mozambique and Tanzania.

The regime of these rivers is characterized as torrential with high runoff during the wet season, from November to March, and relatively low flows in the dry season, from April to October. About 60% to 80% of the mean annual flow occurs in a few months of the year. It is estimated that the flow from the upper riparian represent about 1.5 times that observed in Mozambique.

The shortage of fresh water is mostly due to the reduction of flow by intensive use in the neighboring countries. The central and southern part of the country is where the reduction in flow from hinterland is more critical. It is estimated that South Africa, Swaziland and Zimbabwe now abstract about 40% to 60% of the border flow. The extent of the obstruction of water by neighboring countries is illustrated by the distribution of dams in the Limpopo river basin and in the Incomati, Umbeluzi, and Maputo river basins.

Zambezi River is used in the production of electricity both in Zimbabwe and Mozambique, and used in intensive agriculture in many countries including Zambia, Zimbabwe, and Mozambique. Pungoé River is used for irrigation of the tobacco plantation in Zimbabwe and to supply water in the cities of Mutare, in Zimbabwe and Beira, in Mozambique. The Elephant River (a tributary of Limpopo), is heavily used in South Africa, for cooling at the thermal power stations that serve Gauteng province. In this sub-catchment there are most of the coal deposits that supply the thermal stations in South Africa. Apart from the dams constructed to supply the mining industry, power generation and agriculture, this river also serves as the main supplier of water to Gaborone, the capital city of Botswana. Incomati and Umbeluzi rivers are extensively used for irrigation in South Africa and in Swaziland, respectively.

The reduction in flow may cause the deterioration of the water quality down stream, and may allow for upstream salt intrusion, with consequences in the agriculture (Zambezi, Limpopo rivers). The reduction in flow is often associated with the reduction in sediment inflow rate, this may trigger erosion process in the river mouth and affect the estuarine and coastal ecosystems (Zambezi). The dams, because they change the natural regimen of the river, introduce chronic stresses in the marine living organisms. The shrimp stock in Sofala Bank is decreasing and such reduction is a reflection of the reduction in the recruitment population due to incompatible Zambezi runoff. High runoff during the dry season prevents the migration of larvae and juveniles of prawns to the mangrove, their nursery areas, and on the other hand low runoff during the wet season results in low recruitment. Intensive agriculture or mining activity, because it is associated with intensive use of chemicals, has further implication in water quality. Return flow from irrigation plantations and/or from mining activity is often polluted. Further, the reduction in water flow in upstream countries increases the potential for regional conflicts. This is the case with Zimbabwe (Zambezi, Pungoé, Buzi rivers), with South Africa (Limpopo, Incomati rivers) and with Swaziland (Umbeluzi River).

In addition to the reduction of river flow, the efficiency of the production and use of water is low. The irrigation efficiency is only 50%. A lot of water is lost in the distribution network of the

urban areas, due to inadequate and inefficient distribution scheme. Some of the pipes and tanks for keeping water are corroded and leaking.

**Table 12. Pollution Loads to Ground Water Sources (Kg/Day) in Dar es Salaam**

Type	Without Facilities	Pit Latrines	Septic Tanks	Sewer Domestic	Losses Industry	Total (Tonnes)
BOD	1,100	15,282	7,641	1,221	1,899	27
COD	1,161	16,131	8,068	1,289	11,994	29
Suspended solids	1,833	6,116	3,832	2,035	3,148	18
Dissolved solids	3,258	97,857	61,128	3,618	5,596	196
Total N	120	4,829	3,018	3,618	5,596	10
Total P	23	915	572	34	52	2

It is also useful to show the water supply and demand balance in the coastal areas of Tanzania, which may illustrate a more general pattern at least in some parts of coastal states (Table 13).

**Table 13. Rural Water Supply and Population Coverage by Administrative Coastal Regions (Tanzania) in 1993 and Projected Demand to year 2002**

Region	1993 Population (000)	Population Coverage (000)	Coverage %	Water Demand (cubic meters)	Supply in 1993	Demand in 2002 (cubic meters)
Coast	682	265	32	30,690	11,939	39,006
Dar-es Salaam	228	131	57	10,278	5,895	15,673
Lindi	624	309	49	28,089	13,906	33,569
Mtwara	661	522	83	38,785	32,517	43,955
Tanga	1198	715	59	53,910	32,212	64,998

Source: Institute of Marine Science, Zanzibar

**Table 14. Urban Water Supply/Demand for Coastal Districts (Tanzania) in 1993**

District	Population	Population Coverage	Coverage %	Water Supply (cubic meters)	Demand (cubic meters)
<b>Coast</b>					
Kibaha	19,386	10,523	92.45	720	779
Dar-es Salaam			67.0	191,000	409,500
<b>Mtwara</b>					
Mtwara				3,600	8,500
Newala				2,400	2,500
Masasi				1,500	2,000
<b>Lindi</b>					
Lindi Urban	52,637	39,749	76	1,500	3,500
Kilwa Masoko	10,743	9,050	84	850	2,400
Liwale	15,036	13,500	90	255	1,300
Nachingwea	28,021	24,771	88	1,452	3,500

<b>Tanga</b>					
Tanga Municipal	252,811	128,350	60.6	24,400	40,217
<b>Pangani</b>	5,640	4,675	70.8	1,374	1,939
Korogwe	25,869	25,000	25.9	1,469	5,675
Muheza	13,872	12,108	44.9	1,728	3,859

Source: Institute of Marine Science, Zanzibar

## V.2 Decline in Harvests of Marine and Coastal Living Resources

### a. Status of the problem/issue

In some countries in the region, there is evidence indicating that the artisanal as well as the commercial fisheries have exceeded or are about to exceed the point of sustainability. For example, in recent years, the artisanal and industrial coastal fisheries in Tanzania have been failing consistently. The artisanal fish landing has decreased from 54527 tons in 1990 to 32286 tons in 1994.

### b. Transboundary elements

Major transboundary elements of the problem can be summarized as follows:

- Loss of income from regional and global trade of marine products
- Region-wide decrease in biodiversity of the marine living resources including the disappearance of high quality critical natural resources
- Region-wide destructive fishing techniques degradating coral reefs, mangrove and seagrass habitats
- Increasing catch effort on pelagic species such as tuna, bill fish, king fish and sharks
- Non-compliance to the FAO Fisheries Code of Conduct

### c. Environmental impacts

- Loss of biodiversity
- Changes in food web
- Changes in community structure due to over exploitation of one or more key species
- Increased vulnerability of commercially important species
- Long term changes in genetic diversity
- Stock reduction
- Loss of top predators
- Habitat degradation due to destructive fishing technique

### d. Socio-economic impacts

- Reduced income
- Loss of employment
- Population migration
- Conflicts between user groups
- Lost of recreational opportunities
- Decline in protein

Over-exploitation of fishery resources may have impacts on the status of the coastal communities in a number of ways similar to those of modification/loss of ecosystems and destructive fishing practices.

Fishing is an important economic activity practised by communities living along the coast. Artisanal fishing contributes more than 96% of the nation's total marine fish landings (TCMP, 1999).

According to fishermen, certain types of fish species are not easily available these days due to overexploitation. Catch figures however do not reflect great changes in catch per unit effort, which generally declines with a decline in stock. Indeed, although the catches of certain species, e.g., sardines, scavengers, and mackerels, have increased over the past decade, current catch rates are less than 50%. Despite the declining catch per unit, the number of participants in the fishing sector remains high.

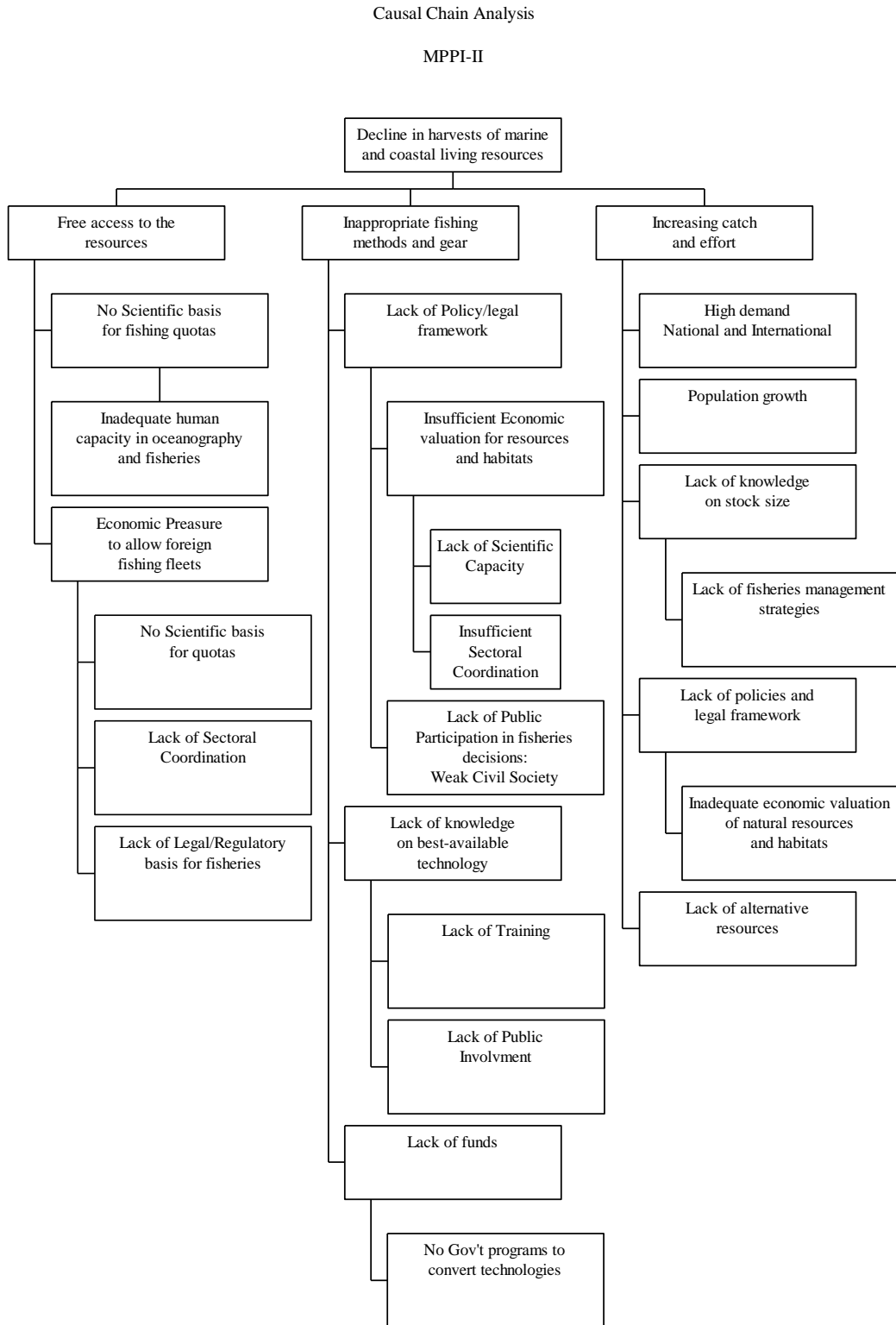
**Table 15. The number of coastal fishermen deriving their livelihood from fisheries**

Country	No. of Coastal Fishermen
Comoros	8,000
Kenya	8,000
Madagascar	42,556
Mauritius	2,700
Mozambique	80,000
Seychelles	1,000
Tanzania	4,200

Source: Institute of Marine Science, Zanzibar & Country Reports

- e. Causal chain analysis

**Figure 4. Causal Chain Analysis: Decline in harvests of marine and coastal living resources**





f. Sectors and Stakeholders

The main government sectors involved in the fisheries issues are the environmental ministries, agriculture/fishing ministries, and municipal and regional governments. The Stakeholder Analysis identified the energy ministries as major government sectors (perhaps for both oil and gas sector impacts as well as hydropower). Affected stakeholders include local fishermen, coastal zone residents, and scientific community.

g. Supporting Data

According to Salm, (1998) sharks appear to be over-fished in several areas, including parts of Somalia and Tanzania. Both shark and ray catches have declined significantly in Tanzania, particularly at Mafia and Songo Songo Islands. Furthermore, there is evidence that increased commercialization of octopus, sea cucumber and seashells harvest has resulted in declines of these species in a number of areas in Tanzania, Kenya and Mozambique (Salm, 1998 and WWF, 1997).

**Table 16. Fishery resources, catch, and level of exploitation in Mozambique**

Resource	Potential (mt)	Estimated Catch (mt) 1993	Level of Exploitation
<b>Crustaceans</b>			
Shallow-water prawns	19,100	11,522	Intensive on Sofala Bank and Maputo Bay. Moderate in zones only accessible to artisanal fishery
Mundle prawns	4,100	3,154	Intensive
Deep-water prawns	3,500	1,830	Moderate
Deep-water Lobster	400	292	Intensive
Crayfish	500	450	Moderate
Deep-water crab	800	309	Moderate
Rock lobster	150	20	Low
Mangrove crab	13,300	2,000	Low
<b>Marine Fish</b>			
Large Demersals	29,500	7,338	Unexploited on St. Lazarus Bank, moderate in rest of the country
Large pelagics	37,500	4,212	Very low
Sharks	10,500	2,236	Low
Small demersals	116,500	15,875	Low
Small pelagics	131,300	35,894	Low
Deep-water fish	500	250	Low
<b>Molluscs and other marine resources</b>			
Holothurians	750	700	Intensive
Cephalopods	2,000	240	Low
Algae	500	0	Low
Clams & bivalves	2,000	20	Low

Source: Anon., 1994

The development of fisheries and agriculture is accompanied by an accelerated degradation of the environment. If this situation is not controlled, it may result in a complete destruction of both marine and inland water ecosystems. As mentioned above, the civil war contributed to the increase of pressure in the coastal resources, including fisheries. Shrimp, the major fishery in Mozambique, is one of the world's most valuable fishery resources. Its high price in the

international market has led to a rapid development of the shrimp fishing industry, with a consequent increase in the fishing effort, beyond the levels of sustainability. The resulting reduction in availability of shrimp led to a low income that often does not compensate the large investment made. The regulatory measures applied to date have not yet succeeded in preventing this situation.

**Table 17. Fish Catch (tons) by type of fisheries in Mozambique**

Type of Fish	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
<b>INDUSTRIAL FISHERIES</b>											
Total	2495	2528	2673	2158	2391	1905	2270	1252	1769	17721	1628
Shallow w. shrimp	1	4	5	5	2	0	1	2	0	7	1
Deep water shrimp	7575	7513	7328	5724	5957	7050	6338	6698	6321	7344	7043
Demersal fish	2412	2285	3726	3154	2841	2350	1652	1833	2250	1770	1771
Deep water lobster	1252	1341	1370	1036	8276	7757	5391	1756	3341	2604	2503
by-catch (S. shrimp)	4	6	1	1	237	203	247	292	294	208	7
by-catch (D. shrimp)	255	136	170	163	780	720	369	741	603	623	1150
crabs	1689	1258	930	753	-	168	332	260	262	266	202
prawn	21	26	148	30	190	257	156	309	328	311	190
squids	381	336	259	135	207	341	186	443	261	179	132
octopus	46	224	231	167	57	8 6	7338	140	36	60	35
tuna	49	89	91	64	5367	119	19		3914	3347	2461
marlins			152	1033				51	30	29	36
sharks										312	358
rock lobsters										165	21
other crustaceans											194
											178
<b>SEMI-INDUSTRIAL FISHERIES</b>											
Total	381	385	342	164	239	941	1271	2834	2405	4184	7123
Shallow w. shrimp	48	58	94	44	74	179	184	275	222	157	396
Demersal fish	223	223	155	105	111	448	516	1053	892	561	-
By-catch (S. shrimp)	110	104	93	16	55	313	65	809	361	293	584
Crabs						-	3	3	1	0	-
Squids						1	3	5	4	0	1
Fresh water fish								689	925	3137	5574
Other fish											568
<b>ARTISANAL</b>											
Total	1333	1065	5108	5811	8767	5544	3835	3839	3362	3512	1151

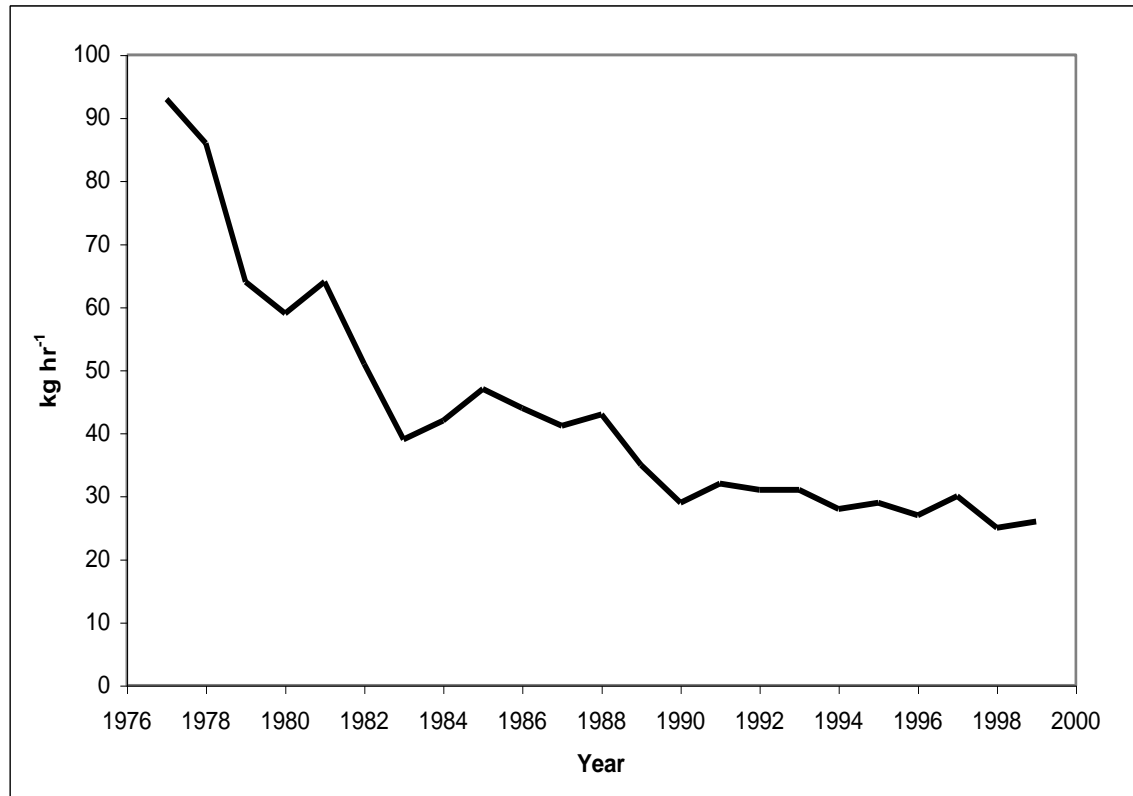
Shallow w. shrimp	8	3	14	135	832	469	237	375	102	199	1
Demersal fish	143	96	5093	5676	7436	4900	3447	3300	3205	3044	567
Lobsters	1319	1055			231	5	30	20	13	40	9987
Crabs	5	7			198	133	84	95	15	103	130
Squids					2	20	29	42	16	82	374
Holothuria					-	5		0	-	6	329
Shell fish					68	12	9	5	11	38	54
octopus								2			57
											13

Source: Department for Fisheries Administration (DAP)

Most of the main rivers in Mozambique emanate from outside the country and most of them are impounded. These rivers favor the development of fisheries, for their environmental conditions attract ecological shelter for some economically important fish species (Bernacsek, 1984). The case of the Cahora Bassa reservoir colonized by Lake Kariba Kapenta that resulted in development of a semi-industrial fishery, is an example. On the other hand, intensive agriculture practice along river valley may affect fish productivity in estuarine areas due to excessive use of agro-chemicals if precautionary measures are not applied timely. Little is known about estuarine eutrophication in Mozambique river reservoirs. However, in the view of the current rate of expansion of agriculture in Mozambique and in the neighboring countries, it should be expected that eutrophication might be a worrying issue in the near future.

The most affected fish resource is the shallow water shrimp. Its total annual production in Sofala Bank dropped from about 10,000 tons in late 70s to about 6,000 tons in late 80s and recovered to about 9,000 tons in 2000. On the other hand, the fishing effort increased from 10,000 fishing hours in late 70s to about 20,000 in the late 90s. Therefore, the observed increase in the annual catches does not mean an increase in the stock of shrimp. In fact the stock of this precious resource is decreasing. This is confirmed by the decrease in the availability, expressed in catch per unit effort (c.p.u.e), Figure 5.

**Figure 5. Evolution of the catch rates of shrimp on Sofala Bank (Hoguane, 2000)**



**In Kenya, most perceived impacts of over-fishing by commercial trawlers in especially the Ungwana Bay and Malindi Bay lack supporting documented data. However, various reports on impacts of over-fishing on particularly coral reef systems have been documented (e.g. McClanahan & Muthiga 1987)**

- Over-fishing in coral reef habitats has been shown to cause reef degradation and adversely affect the productivity and biodiversity.
- Trawling for shallow water shrimp in the Ungwana Bay has resulted in destruction of the seagrass habitat, and impacted on productivity and fish diversity (as evidenced by claims of diminishing catches by artisanal fishermen).
- Excessive by-catch and its disposal is an important issue of concern.
- Threatened marine species that frequent seagrass beds in Ungwana Bay, namely dugongs, the green turtles and the hawksbill turtle are at risk from shrimp trawlers, which often catch them in their trawl nets and kill them.

Artisanal fishery in Mauritius involves lagoon as well as the off-lagoon activities of fishermen using “pirogues” of 6-10 meters long. It uses traditional means and methods of fishing. The fishing implements used are hooks and lines, basket traps, large nets, gill nets, canard nets, cast nets and harpoons. The “pirogues” are propelled mostly by outboard motors, oars and sails, while the rest are equipped with inboard motors. The artisanal fishery is the main source of fresh fish supply for the local market. Off-lagoon fishery is a relatively new activity and professional fishermen are more interested in it as the catch is higher than that of the lagoon and guarantees a good income to the operators concerned.

**Table 18. Catch per Fisherman/Day (kg) in Mauritius**

Year	Lagoon	Outside lagoon
1994	5.5	6.8
1995	4.1	6.4
1996	3.9	5.4

Source: National Report from Mauritius

The value of artisanal fishing represents around 46.3% of the total value of fishery products. The following table shows the incidence of artisanal fishery compared to the total output in the sector.

**Table 19. Production and Employment in Mauritius, 1995**

Sector	Production (Tons)	%	No. of Fishermen
Artisanal Fishery (Mauritius, Rodrigues, Agalega)	2,973	17	2,711
Big Game Fishing	650	4	
Amateur Fishing	300	2	
Aquaculture	155	1	
Sub-total	4,078	24	2,711
Bank Fishing	6,768	38	786
Tuna Fishing	6,693	38	
TOTAL	17,539		3,497

The above clearly shows that in 1995 artisanal fishery represented only 17% of the total production but employed 2711 professional fishermen.

There are 61 landing sites in Mauritius, 15 in the North, 22 in the West, and 24 in the East. In Rodrigues, the landing of fish is done in an informal way near villages and on the coast.

**Table 20. Annual Catch from submerged Banks in Mauritius**

Year	Vessels	S. de Malha	Nazareth	St. Brandon	Chagos	Albatross	Total Catch
1993	17	3,173	1,358	590	195	261	5,577
1994	16	3,167	1,591	224	307	232	5,521
1995	15	2,682	1,609	470	218	312	5,291
1996	15	2,283	1,253	432	321	135	4,424

**Table 21. Tuna Landing in Mauritius**

Tuna Landing		
Year	No. of Landings	TOTAL (Tons)
1993	21	10,279
1994	17	7,689
1995	15	6,179
1996	12	2,815

Lagoon artisanal fishing has been a traditional activity for coastal communities in Mauritius and Rodrigues. With the ever-increasing demand for marine products and the incentives given to professional fishermen, the industry has not improved over the past decades. In fact there has been a significant drop in catch. In Mauritius the fish catch has dropped from 1597 tons in 1987 to 1246 tons in 1997.

**Table 22. Annual coastal fish catch (tons) in Mauritius**

YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
CATCH	1362	1597	1479	1544	1637	1568	1775	1583	1663	1443	1616*	1246*

Source: Ministry of Economic Development and Regional Co-operation (1997)

\* Source: Ministry of Agriculture, Fisheries and Cooperatives (1999)

Some of the species (Octopus) have completely disappeared from the local market as fresh material but is only available in the frozen form from neighboring countries. The Rodriguan octopus industry has been heavily affected; there has been a considerable decline in catch and size over the past years.

In Seychelles, local fishermen exclusively operate the artisanal fisheries sector, where an estimated 1,000 fishers are active, possessing a fleet of about 400 fishing vessels. After a sharp decline in fish landings in 1998, the 1999 catch recovered to the highest level since 1993.

**Table 23. Total Artisanal Catch (1994-1999) in Metric Tons<sup>61</sup> in Seychelles**

1994	1995	1996	1997	1998	1999
4,428	4,313	4,510	4,095	3,334	4,842

For the trap fishery land mostly Rabbit fish (*Siganus spp*) representing 60 % of landings and some Scaridae, Lethrinidae, Mullidae and Heamulidae. Studies in 1995 showed that although there is a decrease in total biomass, processes of recruitment and growth are believed to be sufficient to allow sustainable yields at the present fishing levels. It should be emphasized, however, that the yields from heavily fished areas might only be maintained because larvae can recruit from adjacent and less fished areas. Thus the collective effects of fishing must be considered. Effects of fishing on reef fish are unknown.

The National report from Madagascar reveals the decrease in commercial stock of lobsters, shrimps and sharks, though no data are available. The report also states the pressure on turtles and *Dugong dugong* as well as rapid disappearance of shells.

## Tanzania

<sup>61</sup> Source: Seychelles Fishing Authority (SFA) Annual Report 1999

Based on the fishery resources data as well as interviews with fishermen, there are indications that catches of some fishery resources are declining. Here are some examples:

- i) The total annual catch in Zanzibar has decreased from about 20,000 tons in 1988 to less than 13,000 tons in 1998. The decline in fish catch has also been observed in some specific areas such as in Chwaka Bay in Zanzibar (Jiddawi, 1999a) and for specific components such as the reef fisheries of Zanzibar (Jiddawi, 1998).
- ii) The small pelagic fisheries undertaken by Zanzibar fisheries cooperatives have also experienced significant decline in their catches. Their catch has declined from 600 t in 1986 to 91 t in 1997 (Jiddawi, 1999b).
- iii) According to Ardill (1984), the catch rate of long line fisheries in Tanzania has declined substantially, in numbers and weight. Also shark fin trade has declined in Tanzania (Barnett, 1997; Jiddawi and Shehe, 1999). Both shark and ray catches have declined significantly, particularly at Mafia and Songo Songo islands.
- iv) Furthermore, there is evidence that increased commercialization of octopus, sea cucumber and seashell harvesting has resulted in decline of these species in a number of areas in Tanzania. The export of sea cucumbers (beche-de-mer or trepang) is one of the more profitable areas of marine resource extraction associated with coral reefs (Table 10).
- v) Overfishing of the triggerfish, results in a proliferation of sea urchins which are known to be bioeroders of reefs (Kamukuru, 1997).
- vi) Benno (1992) showed that, of the catch landed by beach seining at Kunduchi, 51.3% were immature fish, 37.8% had developing gonads and only 7.8% were in spawning state. This means that about 90% of the beach seine catch had had no chance to spawn during their lifetime. The mesh size of most of the seine nets used did not exceed 12 mm.

**Table 24. Sea cucumber export from Tanzania**

Year	Dry weight (kg)	Value (USD)
1992	178 373	411 979
1993	326 620	481 098
1994	530 192	884 169
1995	263 870	353 919
1996	296 410	450 405

Data from the fisheries department MNRT (1996) show that there has been a decrease in landed catch with a slight increase in the number of fishermen and gear from 1985-1986 to 1995-1996. Table 26 illustrates the fisheries statistics 1985-1995 showing the downward trend in catch per fisherman for the 10-year period.

**Table 25. Total marine fish production (in tons) for Tanzania mainland: 1985 –1995.**

Regions	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Total
Tanga	4,547	4,402	4,865	7,618	5,441	5,544	4,187	4,187	4,856	5,373	5,373	56,395
Coast	10740	10745	11402	11950	10998	16500	12632	10659	8,609	9,148	9,148	122531
DSM	6,834	10656	6,352	14002	15256	14557	15452	16502	14867	16616	16616	147711
Lindi	11589	14051	7,325	5,965	8,042	9,886	12071	6,379	3,271	3,606	3,606	85791
Mtwara	7,963	5,327	7,325	7,325	7,408	8,039	8,039	4,455	2,624	2,543	2,543	63591
Total	30084	45182	37269	46860	47145	54527	52381	42183	34226	37286	37286	476019
Commercial	900	1,483	1,799	2,190	2,438	2,015	1,510	1,119	1,223	1,787	1,787	18251

Source: Ministry of Lands, Natural Resources and Tourism. Fisheries Division, 1985 – 1995 Annual Reports Statistics.

### **V.3 Degradation Of Coastal Habitats (Mangroves, Seagrass Beds, And Coral Reefs), Loss Of Biodiversity.**

#### **a. Status of the problem/issue**

The coastal ecosystems of the region are generally both rich in natural resources and highly productive. Important habitats include mangrove forests, coral reefs, and seagrass beds. These ecosystems sustain a great diversity of marine life and are an important food source for most coastal communities. There is great interconnectivity between the ecosystems. The integrity of each ecosystem is dependent on the health and influence of adjacent ecosystems. For example, there is nutrient, sediment, and organic matter interchange between the coral reefs and mangrove ecosystems.

Coral reefs and mangroves are the most biologically diverse ecosystems and greatly at risk. Coral reefs grow in clear water and reefs growth is extremely sensitive to pollution, whether due to chemical contaminants or suspended sediments. The rapid expansion of coastal populations and consequentially increased loads of domestic sewage, agricultural runoff and industrial effluent to the marine environment represents a significant threat to the coral reef habitat and human health.

Mangroves are under threat from both the environment and human activity. Heavy rainfall and extreme drought can lead to super-dilution and hypersalinisation of the mangrove swamps, causing disturbance in the regular development of the mangroves.

The increase in salinity threatens the normal growth and the survival of the plants and animals living in the swamps. Gundry et al. (1981) point out that although salt is important for growth and survival of mangrove plants, an extreme high salinity would retard even the most resistant species. River floods and wave action may cause infilling and blockage of the mangrove creeks with sediments.

Human threat, apart from the small scale subsistence fishing, has been characterized by destruction of mangroves for buildings, farming, salt mining, port and airport construction and industrial sites. Often the mangroves are viewed as useless land, and hence, vulnerable to alternate use or used to dump wastes (John and Lawson, 1990).

#### **b. Transboundary elements**

The transboundary elements of the degradation of coastal habitats and loss of the biodiversity can be describe as follows:

- Marine living resources are often migratory
- Coastal zone habitats are the backbone for the productivity of marine and coastal habitats.
- The coastal habitats provide feeding and nursery grounds to migratory species
- The coastal habitats are accumulating transboundary pollution
- Degradation of coastal habitats contribute to the overall decline of regional and global biodiversity
- Regional-wide destructive technique degradating coral reefs, mangroves and seagrass habitats
- The sustainability of marine and coastal biodiversity depends on the integrity of the interlinked ecosystems that supports all trophic levels in the food chain.
- Incidental and illegal catches of endangered species
- Impact to migratory species and their habitats



- Damage to transboundary ecosystems

c. Environmental impacts

- Loss of biodiversity
- Loss of natural productivity
- Reduction of fish stocks
- Loss of migratory species
- Changes in coastal ecosystems
- Depletion of mangroves
- Degradation of coral reefs
- Effects on number and distribution of global population of certain migratory species
- Reduction in value of marine resources
- Degradation of coastal landscape
- Changes of the hydrological regimes

d. Socio-economic impacts

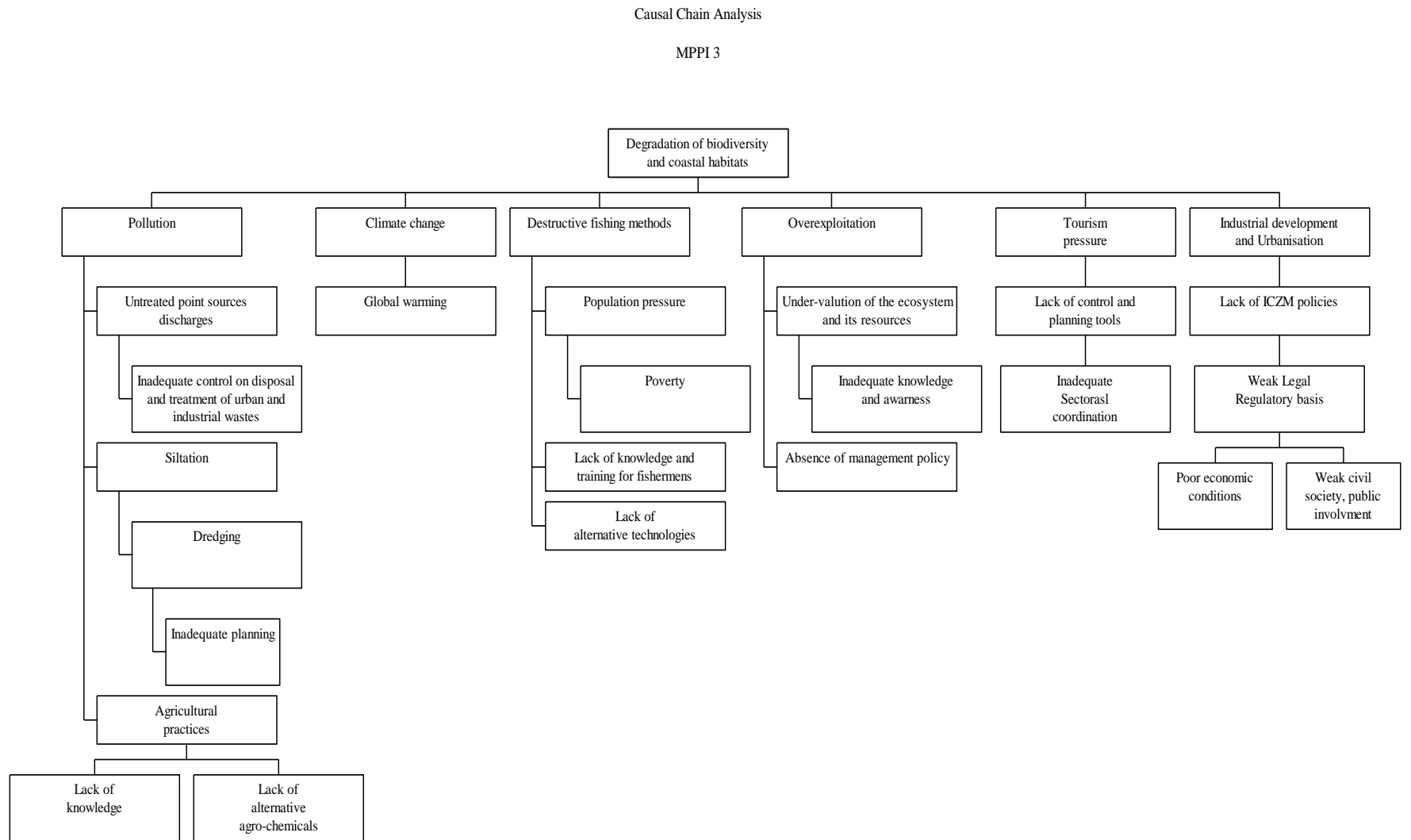
The degradation of coastal habitats by an expanding coastal population leads to the degradation of the interdependent habitats and reduced fish catches. For example, a reduction in seagrass or mangrove cover can reduce fish spawning, leading to reduced catches, which has both social and economic implications, particularly for artisanal fisheries, the income from which represents a significant proportion of GNP. Some of the most important impacts include:

- Reduction of income from fisheries
- Changes in employment
- Loss of aesthetic value
- Loss of income from tourism industry
- Loss of cultural heritage

e. Causal chain analysis

Degradation of biodiversity and coastal habitats is shown on the next page (Figure 6).

**Figure 6. Causal Chain Analysis: Degradation of biodiversity and coastal habitats**



f. Sectors and Stakeholders

Decline in biodiversity is prioritized as a regional issue primarily by agriculture and fishing ministries, and secondarily by the scientific community, environmental ministries, NGOs, and fishermen. The primary government stakeholders include regional and municipal governments, state industries, agriculture/fisheries ministries, and the scientific community. Primary affected stakeholders include coastal residents, fishermen, environment ministries, agriculture and fisheries ministries, and NGOs.

g. Supporting Data

Degradation of critical habitat such as mangroves, seagrass beds and coral reefs and water quality can result from a number of practices, most of which are common to most of the countries of the region. These include:

- Destructive fishing methods such as dynamite fishing, beach seining and poisoning. A recent survey in Tanga, Tanzania has shown that dynamite fishing is responsible for the damage beyond repair of 10% of coral reefs in the REGION, and 70% show significant amounts of damage but could recover if appropriate measures are taken in time (Makoloweka and Shurcliffe, 1997). In southern Tanzania, dynamiting is conducted in shallow areas from the Songo Songo archipelago down to Mtwara District to the Mozambique border (Guard and Masaiganah, 1997).
- The use of weighted seine nets, locally known as "juya," over coral reefs is also contributing to significant destruction in coral reefs in Tanzania and northern Kenya.
- Coral mining is practiced along the mainland coast for production of lime or building blocks. In some areas such as Mafia Island (Dulvy et al., 1995) and southern Tanzania coast (Guard, 1997), living corals are mined with significant impact on coral reefs.
- Mangroves have been heavily cut in certain areas of Kenya, Madagascar, Mozambique, Seychelles, and Tanzania for different purposes. In Tanzania, mangroves are cleared for the construction of salt works, for lime making, and as fuel wood. In Kenya, high demand from the tourism and industrial sector for mangrove wood has been maintained by its low cost and high quality.
- Loss of the coastal forests in Kenya, Mozambique, Madagascar and Tanzania, is significant. These forests have cleared for a number of reasons including agriculture, pole cutting, charcoal making, lime making, salt making, grazing, and urban and rural building development. In Tanzania, the once extensive coastal forests have been reduced from 59300 km<sup>2</sup> to its present size of 1050 km<sup>2</sup> or about 2% of the original area.
- Dugongs and turtles are considered endangered in most of the countries of the region. This due to increase in incidental catches of these species as well as degradation of their environment; seagrass beds for the dugongs and beaches for the nesting turtles.

## **Mozambique**

Most of the mangroves in Mozambique are of fringing type, and are distributed almost along the entire coast of Mozambique. The largest concentration is located in central Mozambique, in the Provinces of Sofala and Zambezia, central Mozambique. Maputo Bay has the largest concentration in the southern part of the country. The area of mangrove vegetation has obviously changed throughout the years. Saket and Matusse (1994) compiled information of the mangrove vegetation density for different coastal provinces, using satellite imagery, in two distinct years (1972 and 1990) and worked out the evolution rate of the mangrove. According to their result (Table 18), the Maputo Bay showed highest deforestation rate (15.2%) followed by Sofala (4.9%) in 18 years. Higher deforestation rates around the coastal cities may be related to higher concentration of the population in these areas in the

80s due to the civil war. However, the annual rate over the entire coast remained relatively small (0.2%). There is no data available on mangrove development in the recent years.

**Table 26. Mangrove degradation in Mozambique, 1972-90**

Province	Area 1972 (Ha)	Area 1990 (Ha)	Area degraded (Ha)	New Areas (Ha)	Change %
Maputo	14,605	12,599	2,217	211	15.2
Gaza	387	387	0	0	0
Inhambane	20,094	19,848	246	0	1.2
Sofala	129,997	125,317	6,334	1,654	4.9
Zambezia	159,417	155,757	3,766	106	2.4
Nampula	55,849	54,336	2,006	493	3.6
Cabo Delgado	27,730	27,836	0	106	0
Total	408,079	396,080	14,569	2,570	3.9

Source: Integrated Coastal Zone Management in Mozambique, Lundin & Linden ed. 1996

The main causes of mangrove depletion are:

- (i) Removal for firewood and construction, observed all over the coast with main emphasis in the vicinity of the large cities, Maputo and Beira;
- (ii) Clearing for salt ponds, salt production, and for agricultural practices, observed most in the northern provinces;
- (iii) Changes due to erosion, observed in the Zambezi Delta;
- (iv) Clearing for building, observed mainly in Maputo;
- (v) Blockage of the creeks connecting the mangrove swamp to the sea water, by the sand waves caused by the waves or storms, observed in Maputo, Portuguese Island (Hatton and Couto, 1992).

Although there is a regulation protecting the mangroves, its enforcement has been difficult due to the fact that there is no alternative for building and fuel, main purpose for which they are used, against the increasing demand due to population subsistence. Other forms of fuel and building are expensive for the local population with low income. In addition, the long civil war, and as mentioned above, has greatly reduced the options.

Depletion of mangrove causes the reduction in coastal productivity. Reduction in fish and crustacean stocks observed in Sofala Bank (Skagen *et al.*, 1997) and in Maputo Bay may be partially attributed to the reduction in the mangrove forest. Migration pattern of the species that habit temporary the mangrove swamps (e.g. prawns of Penaid species) is likely to be affected by the reduction in the mangrove area and along with other species that are related to this ecosystem. Hence, the species composition is likely to change and biodiversity affected.

**The main source of the destruction of coral reefs are associated with:**

- (i) Overexploitation, observed in the northern part. Local population harvests the coral and the ornamental shell associated for exportation.
- (ii) Use of destructive harvesting techniques, observed all over the country. Tourists use snorkeling, spearfishing. There is suspicion that people are using dynamite in the northern part of the country. The dive rate on the reefs of Ponta do Ouro and surrounding are reportedly to be as high as 30,000 to 40,000 dives a year. Children use rudimentary spearfishing tools to collect reef fishes from reef flats. Other damaging fishing techniques used by artisanal fishermen include: beach seining, gill nets, line fishing, traditional traps, poisoning.

- (iii) Environmental factors such as storms cause severe destruction in the coral reefs. Erosion and consequent sediment transport cause siltation (Bandeira, 1995; Gove, 1995). Considerable source of sediments comes from erosion of coastal sand dunes, accelerated in part by the deforestation of the vegetation over the dunes as reported below.

Corals in the northern Mozambique, because they are much shallower, are more exposed to the action of storms. While the southern corals, apart from those at Inhaca Island, are relatively more protected from the storms and the rich of divers, as it requires appropriate diving equipment. There are reports of sedimentation problems in the corals of Inhaca Island.

Sewage is not treated and discharged directly into the sea. Industrial and agricultural residues are also polluting the sea both through sewage and river effluent. The ports do not have any device for oil spill and tank cleaning. Moreover, the Mozambique Channel is the route of large oil tankers and there is no control for tank cleaning nor a contingency plan for oil spills (MICOA, 1995a). The circulation pattern of the coastal water in the southern Mozambique is northwards, meaning that in case of pollution in the Kwazulu Natal, industrialized northern province of South Africa, there is a potential danger of the southern corals of Mozambique being affected. On the other hand, some pollutants from Mozambique may reach the outer slope in the domain of south going Mozambique current, and thus carried towards South Africa.

The major threats to the seagrass ecosystem are:

- Overexploitation. Because the seaweed are consumed, used in industry and hence of commercial value, their exploitation in some areas (northern part of the country) exceed by far the levels of sustainability.
- Destruction by artisanal fisherman and local population. The collection of invertebrates in the intertidal area, carried by women and children during the low tide, often involves digging and revolving huge amounts of sand and steeping in the seagrasses. The revolving of sediments may be beneficial because it enhances the recycling of nutrients, but if done in higher intensity, as it seems to be in the shores near high population centers (Maputo Bay), it can result in higher erosion with consequent siltation and/or destruction of seagrass beds.
- Deforestation of coastal sand dune vegetation. Bare land is vulnerable to erosion. Sand and dust are transported to the coastal waters by rain and/or winds. This results in siltation.

Seagrass and seaweed are among the most productive submerged biotopes. They build up large carbon reserves that are utilized by herbivores such as turtles and dugongs, both endangered species, and birds. Seagrass meadows are used as nursery ground by many species of fish and prawns, and so, contributing to the maintenance of biodiversity. They hold an important artisanal fishery that serves as a basis for subsistence of a large portion of local population. There is an indication that a considerable large population of demersal fish, accessible to line fishing found in Southern Mozambique and that is shared with South Africa, spawn in the seagrass of Southern Mozambique. Hence, management of seagrass ecosystem in Mozambique may be of transboundary nature.

## **Kenya**

The natural resources of Kenya has a continental type of coastline that stretches 500 km Kenya's coast include coral reefs, beaches, mangroves, coastal and Kaya forests. Corals reefs support a rich diversity of species and protect the coastline from wave action. The mangrove habitat which covers an estimated 530 km<sup>2</sup> forms important nursery grounds for a variety of fishes and crustacean and roosting grounds for various species of sea birds. In addition to providing stability against erosion, mangroves act as nutrient traps and help reduce pollution of marine waters. Biodiversity in estuarine and brackish water in int'ertidal mangrove forests is high. Between the fringing reefs and the shoreline are biologically productive lagoons which are critical to fishing activities. Kenya's sandy beaches and

seagrasses are ideal habitats for numerous marine creatures, providing nestling ground for various species of turtles, fishes and molluscs. The lowland and Kaya forests support a highly diverse flora and fauna.

The status of mangrove vegetation, in Kenya can be summarized as follows:

- Mangroves are heavily exploited for the traditional uses of providing poles for the building industry and for fuel wood both for local and export markets. In Lamu and Gazi in particular, there is noticeable reduction in mangrove cover due to over-harvesting, though no data is forthcoming due to lack of monitoring.
- Due to extensive human activities including pollutant loading both from industry and domestic sources in the Tudor Creek, compared to the more pristine mangrove creek of Gazi, the Tudor creek has lower fish diversity.
- Complete clearing of the mangrove habitat (over 5,000 ha) has occurred in the Ngomeni Swamps to pave way for the construction of solar salt pans. Potential impacts expected, as a result of this action is loss of productivity in the creek and a decline in recruitment for the Malindi/Ungwana Bay fisheries.

Trawling activities in the Ungwana Bay have had significant negative impacts on the seagrass beds and on threatened species, which use this habitat. These include the dugong, *Dugong dugon* categorized as vulnerable, and the Green Turtle, *Chelonia midas* and the Hawksbill Turtle, *Eretmochelys imbricata*, both categorized as endangered species. Thus the dugong and turtle species are under threat not only from being strangled in fishing nets, but also from the destruction of the seagrass meadows occasioned by the trawling activities. Indeed, dead turtles have been sighted in the Ungwana Bay whose death has been attributed to incidental catches by trawlers (Wamukoya *et al.* 1996).

Anthropogenic activities that impact on the reefs include tourist activities and artisanal fishing. Over-exploitation of reef resources has been attributed with interference with the delicate predator-prey ecological balance with adverse effects on the coral reef. Over-fishing on the inner reef lagoon was attributed with the removal of the coral eroder sea urchin *Echinometra mathaei* that enhanced degradation of the reef (McClanahan & Muthiga 1989, Muthiga & McClanahan 1987). It is generally recognized that most unprotected coral reefs are subjected to over fishing, shelling and degradation, with resultant changes in productivity and biodiversity (McClanahan 1997, McClanahan & Mutere 1994, McClanahan & Obura 1996).

## **Mauritius**

The destruction of corals through coral trampling, fishing malpractices, damages by boats, and natural causes such as bleaching affect the quality and availability of these habitats for the residing biota. These effects are visible at Grand Baie, Flic en Flac and Belle Mare. In Flic en Flac, the distribution of corals has altered significantly since it was first mapped (Montaggionni and Faure, 1981). Quantitative studies carried out in 1994 revealed that the cover was below 40% both at Flic en Flac and Wolmar. In Grand Baie, the lagoon floor is littered with coral rubbles mostly caused boat anchors. With regard to bleaching, recent studies (Goorah *et al.*, 2000) suggest that 31-39% of live corals in the marine parks of Blue Bay and Balaclava were affected by bleaching. This figure could be higher in regions such as Flic en Flac and Belle Mare. However, Turner *et al.* (2000) reported that the mass-bleaching event of 1998 did not seriously affect Mauritius with less than 10% of bleached corals. However, the same report mentioned of the signs of coral degradation due to boat anchors and cyclones.

The clearing of sea grass meadows, also caused by dredging activities, in particular in front of hotels for bathing areas or for ski lanes, further impact the sea floor causing loss of habitats and destabilize bottom sediments (Ramessur, 1991). Sea grass is known to hold together sediment particles and thus prevent them from being carried by strong currents. Recent studies carried out at Pointe aux Piments

towards the southern end of the Grand Baie site indicate that disturbed areas have significantly lower biomass values, higher turbidity, lower biodiversity with only a few rare crabs, and can take four to five years to recover (Choony, 2001).

Likewise sand mining activities affect the physical status of the habitat. Over 800,000 tonnes of sand are removed from the lagoons annually (NEAP,1999) and the resulting damages of this practice as evidenced at Pomponette-Riambel are two-fold; ecosystems are completely destroyed causing migration and death of associated biota in particular sand dwellers, water currents are changed and sea floor topography modified.

## **Tanzania**

The greatest human impacts on coral reefs are related to destructive or bad fishing practices (Wagner, 1998b). By far the most destructive type of fishing is dynamiting. Dynamite fishing has been practised in Tanzania since the 1960s. In the 1990s, dynamite blasts reached incredible rates. In Mnazi Bay, Mtwara, 441 blasts were recorded over a two-month period (October-November, 1996), while in the Songo Songo Archipelago, 30 blasts were heard every three hours and, at Mpovi reef (near Kilwa Kivunje), 100 blasts were recorded during one six-hour period (Darwall *et al.*, 2000).

Besides dynamite fishing, the use of seine nets around coral reefs is destructive in three ways. Firstly, fishermen sometimes hit the coral heads in order to scare the fish out of hiding, known as the *Kigumi* technique, which has been particularly common on Pemba and the southwestern side of Unguja (Horrill *et al.*, 2000). Secondly, the bottom of the net is weighted down so it breaks corals as it is dragged over the reef. Thirdly, the small-mesh size of seine nets results in the capture of many juveniles.

Another obviously harmful method is the use of poison. Horrill *et al.* (2000) reported that poison (commonly an extract from the *Euphoria* plant) was used for fishing as far back as 1900 and that its use declined during the 1960s though it is still sometimes used today. There are no data on its current extent of usage.

In addition, there are several other fishing methods that may be destructive to reefs, if carried out in an improper fashion. These include octopus fishing, collection of shellfish (which entails reef walking and diving), and the use of basket traps. Other harmful activities related to fishing include the dropping of anchors and boat grounding (Wagner, 1999).

While seaweed farming is thought to be relatively environmentally friendly, it has been reported in Unguja that this activity lowers bacterial production and the abundance of small animals such as nematodes (Horrill *et al.*, 2000).

In Dar es Salaam, Tanga and Zanzibar town, and to a lesser extent, Bagamoyo, Lindi and Mtwara, there are many types of pollution, i.e., industrial, institutional, and domestic discharge; agro-chemical pollutants; and sedimentation brought about by deforestation, poor agricultural practices, and construction activities. These types of pollution affect nearby reefs.

Solandt and Ball (1999) reported that, since coral mining has been a major industry in Mikindani Bay, Mtwara for the past two decades, all *Porites* above a depth of 2 m have now been gleaned from its nearby reefs. Coral mining is also common in Mafia.

While tourism is generally beneficial to the country, if uncontrolled and unmanaged, it may have negative impacts on the environment. If tourists are careless while snorkeling or SCUBA diving, they may break corals or disturb other organisms in the reef ecosystem. Others walk along reefs in search of shells, thus causing damage.

Another type of disturbance is the use of motorized vessels, whether by fishermen, tourists or transporters (e.g., the high speed boats that operate between Zanzibar and Dar es Salaam), which stir up sediments that can affect coral reef ecosystems.

In Tanzania, various uses of mangroves have led to the modification or loss of mangrove ecosystems. For many years, villagers have used mangroves on a sustainable basis for firewood, building poles, boat making, charcoal making and the making of salt by boiling seawater using mangrove firewood. However, with increased population along the coast, particularly in urban centers such as Dar es Salaam, Tanga and Zanzibar, the demand for these resources has increased beyond the capacity of the mangrove ecosystems to regenerate and thus these uses are no longer sustainable in many areas of the country. Particularly, the making of charcoal for sale in urban centers has led to severe degradation of many mangrove areas. In some parts of the country where there is coral mining, the burning of live coral in kilns using mangrove firewood has put a heavy demand on the mangrove forests. These uses have caused fragmentation and modification of many of the mangrove forests in Tanzania.

Besides the above-mentioned uses which entail harvesting or selective cutting, other human activities involve clear cutting of substantial areas of mangrove forests. These include clearing for aquaculture, solar saltpans, agriculture (particularly rice farming), and the construction of hotels, industries, roads, houses, etc. Such clear cutting results in loss of ecosystems or portions of them, which has become serious in the past two or three decades. Large-scale clear felling of mangroves hinders natural regeneration (Germanis, 1999; Masawe, 1999; Semesi 1987, Semesi *et al.* 1999) due to alteration of the soil microclimate and the lack of seed-bearing trees as seed sources.

Yet another way in which human activities have affected mangrove ecosystems is through modification of patterns of water movement, either freshwater or seawater, which is so vital to the maintenance of mangrove forests. Related to this are improper agricultural and forestry practices that have led to soil erosion and change in sedimentation patterns.

Some fishing practices are also harmful to mangroves such as dragging seine nets over the forest floor under the tree canopy. For example, at Mtoni Kijichi, regular dragging of seine nets under the large *Sonneratia alba* trees has resulted in complete lack of seedlings and intermediates to regenerate the stand (Akwilapo, 2001). Digging in the mangrove mud, particularly in the *Sonneratia* and *Rhizophora* zones, in order to obtain polychaetes for fish bait also results in ecological damage of the mangroves (Semesi *et al.*, 1999).

Finally, near Dar es Salaam, Tanga and Zanzibar town, there have been various types of pollution such as domestic, industrial, agro-chemical and solid wastes that have led to modification of mangrove ecosystems. Boat traffic that increases erosive boat wakes also may have negative effects on mangroves.

Destructive fishing practices are amongst the human impacts affecting seagrass beds in Tanzania, particularly beach seining and trawling. Although beach seining is illegal, it is a very common practice in many areas along the coast of Tanzania. Since the net has weights to hold the bottom of the net down, as it is dragged up the beach it uproots the seagrass and scoops up many of the associated organisms. Trawling has a similar effect on seagrass beds, but in the deeper offshore areas.

Near cities, towns and other concentrations of human populations, excessive movement of boats and people leads to direct damage of the seagrass beds, particularly in fish landing sites. Besides direct damage, sedimentation also occurs which has negative impacts on seagrasses by blocking of light and interfering with gaseous exchange on the surfaces of the leaves.

Another human activity which does not have a direct effect on the seagrass itself, but which affects the integrity of seagrass bed ecosystems is the collection of shellfish which leads to loss in biodiversity of these habitats.



As with other marine habitats, pollution causes impacts on seagrass beds, particularly those situated near Dar es Salaam, Tanga and Zanzibar town as well as smaller urban centers.

## Seychelles

The modification and loss of habitat poses a great threat to Seychelles biodiversity. In addition to ecosystem modification directly associated with development related activities (construction, reclamation, clearing of forests, filling of marshes / mangroves, etc.), ecosystem modification associated with invasive species is also an important issue. The relative importance of these issues is illustrated in the following charts, which estimate the relative importance of the major threats to Seychelles endemic plants, terrestrial vertebrates and terrestrial invertebrates, respectively.

The coastal areas of the main granitic islands have already undergone extensive modification, particularly on the coastal plateaus, as a result of human settlement and development. At the time of first settlement in the late eighteenth century the shores were fringed with indigenous coconut palms and other plants brought by ocean currents. Endemic flora is little in evidence, except for occurrences of Vakwa Bord-d-Mer (*Pnadanus balfourii*) and Bwa kaful trwa fey (*Allocphylus sechellensis*).

Over time, the removal of sand and construction has greatly modified the beach landscape. The same processes have altered the lowland and coastal plains, which were formerly dominated by species such as *Terminalia catappa* (Badamier), *Casuarina equisetifolia* (Sed), *Intsia bijuga* (Gayak), *Heritiera littoralis* (Bwa-d-tab), *Calophyllum inophyllum* (Takamaka), *Minusops sechellarum* (Bwa-d-Nat) and *Cordia subcordata* (Porse).

The lowland forests at one time extended up to 200-300 meters up the mountainsides, but following settlement nearly all the coastal and lowland forests on the granitic islands were developed for agriculture and cleared for settlement. The greatest remaining abundance of endemic flora lies at the higher elevations, in the intermediate forests and mountain mist forests, as well as on granite rock outcrops known as glacis (Inselbergs).

In the last 25 years the modification and loss of coastal ecosystems on the main granitic islands has accelerated as a result of rapid social and economic development. This is clearly evident in each of the three prioritized hot spots (the Coastal Plateau of La Digue, the East Coast of Mahe and Anse Volbert, Praslin), all of which are situated on the coastal plateaus (one on each of the three main islands), where considerable development has taken place since independence in 1976.

On the Coastal Plateau of La Digue modification of habitat has occurred primarily as a result of land-use conversion for house construction and tourism development. Other contributing factors are pollution (to a limited extent) from domestic and tourism establishments and changes in sand deposition caused by jetty development. Loss of habitat has occurred mainly as a result of land-use conversion (housing and tourism development), which affects woodland and sandy foreshore habitats.

In the case of the three prioritized sensitive areas, two are located on the main island of Mahe (Port Launay and Baie Ternay Marine Parks and adjacent areas, and the Mahe Wetlands) and are subject to similar impacts from social and economic development. In the case of Cosmoledo Atoll, impacts are different due to the lack of human settlement. In Cosmoledo, the main impacts are related to the exploitation of fisheries and other resources (i.e. illegal fishing and poaching of birds and turtles).

## **ANNEX 19: THE ACEP AND CROSS PROJECT/PROGRAMME LINKAGES**

### **The African Coelacanth Ecosystem Programme (ACEP)**

ACEP is an African Regional Flagship programme run by a consortium of institutions, including universities and technikons, research organizations, government departments, museums, aquaria, Non-Government Organizations (NGOs), government and non-government conservation organizations within, Comoros, Kenya, Madagascar, Mauritius Mozambique, Seychelles, South Africa and Tanzania. The African partnerships are fully in accord with NEPAD principles. ACEP is now a recognized NEPAD programme under the CosMar portfolio.

ACEP also has partner organizations in the corporate sector and internationally beyond Africa (Belgium, Canada, Germany, Japan, Singapore, United Kingdom, United States of America). All partners contribute to the funding of this multidisciplinary project, though currently the bulk of the funding is provided by the South African Government.

In each partner country in Africa, ACEP has a National Management Committee, comprising members from universities, research organizations, government departments that conduct research, and research based NGOs. The programme is guided overall by a Regional Management Committee, on which all partner countries are represented, and ACEP is coordinated by its secretariat within the South African Institute for Aquatic Biodiversity (SAIAB).

The close collaboration, which in many instances will be a virtual merger, will benefit ASCLME by providing access to three and a half years of data, information, regional teambuilding and experience. Not only are the benefits to be measured in terms of scientific input, but ACEP has also conducted an evaluation of the capacity building needs of the region in all of the disciplines of interest to ASCLME and is prepared to make its capacity building plan available to ASCLME as a combined thrust. ACEP's progress in terms of data sharing and GIS, and its environmental education and public awareness programmes are well advanced, having produced over 300 publications, nine films and nearly 50 radio and TV interviews. ACEP also has the greatest ship-board experience of any programme in the region, which once again will be made available to ASCLMEs. Perhaps ACEP's greatest achievement is in building regional goodwill and collaboration, having identified key people and institutions in each country who actively wish to participate in regional marine science initiatives. The harmonization of the two programmes would make this hard-won asset immediately available to ASCLME.

The research agenda that has been and will be pursued by ACEP will offer considerable opportunity for overlap. The description that appears below is incomplete, but yields initial understanding of the potential synergies.

### **A - Marine Geoscience: Habitats for Coelacanths and other Biodiversity**

Mapping the ocean floor is a prerequisite to

- 1) understanding topography and structural habitat,
- 2) providing area-species estimates of value to interpretations of biodiversity and standing stock,
- 3) providing basal layers for GIS decision-making frameworks,
- 4) providing topographic information for oceanography (e.g. current deflection, routes for upwellings,) and
- 5) biology (biogeographic distribution in accordance with habitat continuities and discontinuities etc). In addition, the maps are necessary to plot routes for the submersible, to plan dives and direct searches for coelacanth habitats. Bathymetric maps saved ACEP enormous amounts of ship and submersible time in what might otherwise have been fruitless, undirected searches.

Geological studies also explain the past and provide a basis for certain predictions of the future. The WIO is poorly mapped and hardly understood at all. Such a lack of data impacts on the effectiveness and capability of future management of the area whether the management is for biodiversity, including coelacanths, socio-economic development, fisheries, mining or protected areas.

The accuracy of geo-referenced data and the resolution obtained by multibeam echo-sounders provides a superb base layer for GIS frameworks. In ACEP all data from the Greater St Lucia Wetland Park are being layered on the multibeam maps, so that substratum, depth, oceanographic data, distribution of animals and plants, presence of caves submersible routes, routes followed by tagged coelacanths and other data are all built on the bathymetric maps. This is fundamental to all of the research on the ocean floor and sets the template or model for development of parks to protect biodiversity throughout the WIO. Ground-truthing and seismic work should build on the multibeam bathymetry.

### **Goals of the marine geoscience**

- Develop a team of highly skilled professionals which aspire to and achieve excellence
- Identification of target areas for detailed sea floor mapping on the continental shelf, slope and canyons. Marine protected areas are foci of attention given their relevance to conservation, management, education and promotion of tourism.
- Habitat mapping of shelf and associated reef complexes, slope and canyons using multibeam systems and side scan sonar
- Integration of maps with diving and submersible observations to develop habitat maps (shallow habitats can also use ground-truthed remote sensing)
- Generation of high resolution continental margin stratigraphy for the region using seismic methods, core sampling, micropalaeontology and geochronology
- Sampling of sediments and mapping of sedimentary structures to develop an understating of shelf sedimentary dynamics
- Detailed mapping of canyons to develop canyon formation models
- Identification of palaeo-sea level history from canyon morphology
- Coral coring and analysis to determine palaeo-sea temperatures, flood events, pollution and palaeo-oceanographic dynamics
- Develop the geological studies and associated GIS as a model for use elsewhere in the WIO.
- Use the GIS of canyons as a basis for animated learning programmes

### **Achievements of the marine geoscience**

- Acoustic bathymetry was used to map the 31 canyons of the Greater St Lucia Wetland Park.
- Desk top studies have been developed to indicate likely coelacanth habitats within the WIO and in regions in South Africa.
- Geological sampling, observations (including videos from the submarine) and seismic work has progressed to mainly verify through ground truth the multi-beam bathymetry. This work is being prepared for publication.
- The animated learning programme to enable users to simulate submersible flights through canyons and seek information was developed and taken to WSSD and other festivals for use by children and adults.

### **B - Physical and Biological Oceanography**

In terms of the marine environment South Africa is uniquely positioned. Nowhere else is there a country around which three oceans meet and major planetary current systems flow. The interactions of warm, temperate and cold water masses coupled with powerful flows of the Antarctic Circumpolar Current, the Benguela Current and the Agulhas Current (and their dynamics) produce one of the most complex marine environments found anywhere. The least well understood of these systems are those that impact on the coelacanth environment.

The most fundamental unifying force in the WIO is the poorly understood South Equatorial Current and its divisions southwards and northwards. The newly discovered system of gyres and eddies in the Mozambique Channel, the regions of upwelling and downflow and their impact on energy flow, nutrient cycling, primary and secondary productivity, larval dispersion and connectivity between fishing zones and protected areas for seeding and nursery sites are really not understood and yet, they are vital for management of all fisheries and conservation of biodiversity, including coelacanths.

These systems have a profound influence on our understanding of coelacanths. Changes in water quality, including temperature, currents, oxygen concentration, conductivity and light extinction are all believed to influence coelacanths and are, therefore all parameters that define the coelacanth habitat, and hence habitat tolerance range.

### **Goals of Physical and Biological Oceanography**

To understand the oceanographic processes that drive the WIO and which influence coelacanths, primarily to:

- build a team of skilled oceanographers who aspire to excellence
- define the coelacanth aquatic ecosystem, comparing the known habitats in the WIO
- determine whether coelacanths could be washed from a single source
- understand the manner in which the gyres influence nutrient cycling in the WIO and hence the fisheries and protected areas
- model long-term trends

### **Achievements of Physical and Biological Oceanography**

The findings have significantly enhanced understanding of currents (from ADCP, Long-Term Underwater Monitoring stations/UTRs, deployment of drogues and satellite imagery) , seasonal and short-term changes and aspects of global warming (from UTRs, satellite imagery), developed CTD and ADCP profiles which enable coelacanth habitats to be defined all around the WIO (west of Madagascar) to be identified when used in conjunction with bathymetric data; these profiles correctly predicted where the Tanzanian coelacanths would be found), defined more accurately coelacanth habitat requirements in canyons, identified processes that drive nutrient cycling and dispersal of plankton and larvae, identified processes which impact on South African fisheries, identified the regional need for increased capacity in oceanography and begun to address the need in South Africa and the other countries, increased substantially understanding of oceanography in every country. The findings are being modelled and placed on the internet for use by stakeholders.

## **C - Marine Ecology: Coelacanths, biodiversity and conservation**

The WIO is incredibly rich in biodiversity, but is largely unexplored. It seems however to be poor in biomass which suggests that the economic growth in the future for the region will depend increasingly on biodiversity (ecotourism) and less on biomass (fisheries are very limited and under huge pressure).

The biodiversity of the region is supported by an oligotrophic system, with what might be short nutrient cycling chains, oceanographic gyres and rich coral ecosystems. It has several truly important species, many of which are threatened (e.g. coelacanths, whale sharks, dugongs, turtles) and others which are colorful and interesting. Deep reef ecosystems, in which coelacanths live, are not well known. ACEP has made it possible to study these systems and to link them using the coelacanth as the icon. There is, therefore a heavy emphasis on coelacanth studies, on biodiversity and its distribution and on the trophic relationships and energy flow within the systems through stable isotope and other studies.

Coelacanth research necessitates submersible techniques that not only answer questions regarding coelacanths, but also open the way to better understanding of the entire ecosystem. ACEP has the potential to take a lead in pioneering innovations in submersible studies associated with deep water biotelemetry. The submersible studies (manned and ROV) and other collecting operations in deep water also place ACEP in an exceedingly strong position to investigate whether any of the many invertebrates, algae and microorganisms produce natural products (biomolecules) that are of direct benefit to humans. Internationally, the isolation and identification of these natural products by marine natural product chemists has provided new pharmaceuticals and agrochemicals. Marine biota are an extremely exciting potential source of new biomolecular diversity, not only because of the large number of species present in the oceans but also because the marine environment presents very different physiological and ecological challenges compared to those experienced by terrestrial species. As a consequence of the differences between terrestrial and marine habitats the expectation is that

marine organisms will utilize unique biosynthetic pathways, or exploit unique variations on established biosynthetic pathways, to biosynthesize novel natural products for cancer and other cures, and for agriculture.

All of the biodiversity related topics are linked, but the principal sub-disciplines are treated separately in the sections which follow.

### **C1- Marine ecology: coelacanths**

Many of the enigmatic questions relating to coelacanths which were asked by Prof. JLB Smith in 1939 are still unanswered today. A great deal of progress has been made in the Comoros studies, but it seems that several of the dogmas and conclusions from the Comoros experience are now controversial or need to be questioned afresh. ACEP is in a position to do that. By adopting a biophysical approach ACEP is better placed to answer ecological and evolutionary questions than all previous studies.

Coelacanths are listed on CITES (Appendix 1) and are therefore highly protected. Conservation recommendations and a model which might be followed elsewhere are important practical outcomes.

Work on a “living fossil” in order to answer questions regarding life-history, evolution, ancient genomes, behavior, energy flow, physiology, habitat use, ecological interrelationships and genetics are all highly relevant in taking South Africa to the forefront of marine science, albeit a specialist deep form of sciences. It is also questioning and hence testing concepts and hypotheses.

### **Goals of the marine ecology: coelacanths**

- Determine coelacanth population size, life history, demographics, home ranges, locality of young, feeding behavior and growth to make recommendations that will ensure the highest degree of protection for coelacanths and their habitat.
- Define coelacanth structural habitat and water quality habitat requirements and tolerance ranges (i.e. determine sensitivity of coelacanths on the physical environment temperature, oxygen concentration, currents and sediment) and their physiological responses to ascertain whether global warming, eutrophication and pollution are threats.
- Collect tissues for stable isotope, genetic and genome resource studies
- Conduct fundamental studies to answer questions regarding their apparent evolutionary stasis
- Promote understanding of coelacanths and through this increase ecotourism to marine protected areas, establishing the Greater St Lucia Wetland Park as a model for parks elsewhere in the WIO.
- In the GSLWP, 27 coelacanths can be identified, from three canyons, several are known to move between canyons, they occupy the same set of caves regularly, they are probably living at the upper limit of the temperature tolerance range, only adults have been found, at least two were considered to be pregnant, they seem to enter shallower water when water temperature drops, a pictorial catalogue has been developed to identify them, tissue samples have been collected from 7 individuals. At present, one canyon is a total sanctuary, and limited research access is permitted in the others.
- In Tanzania, 25 coelacanths have been caught, all have died, 12 have been examined and tissues from most have been collected. The NMC of ACEP- Tanzania is protecting their coelacanths and developing a new MPA.
- Three new coelacanths have been caught in the Comoros since ACEP was initiated, one at Mohele Island which is the first to be found there. Tissue samples have been gathered from 2 specimens.
- One new coelacanth has found in Madagascar since the commencement of ACEP, and one frozen specimen, which was vulnerable as it was in a deep freezer of a commercial fishing company, was fixed and preserved for Madagascar by ACEP- South Africa.
- Overall, the understanding of coelacanth behavior and habitat use has been substantially enhanced.

- There is excellent collaboration between ACEP-South Africa and ACEP in the other countries.

### **C3- Marine Ecology: Biodiversity**

Coelacanths share their environment with a variety of organisms and have interrelationships which are unknown at present. One of the earlier questions was whether there is perhaps an entire community of ancient creatures in the coelacanth ecosystem. It now seems that most of the organisms which live with coelacanths evolved more recently. The next question is whether the organisms are the same throughout the range of coelacanths, or are there ecological equivalents or perhaps it does not matter who shares the coelacanth ecosystem? Knowledge of deep reefs is limited necessitating a full study of the habitats in the GSLWP and elsewhere to establish what lives in the coelacanth ecosystem and what are the relationships of those animals to coelacanths. These studies need to be placed in the context of the WIO and the needs of the region.

Understanding of biodiversity and ecological processes underpins the management of marine resources and ecosystems. In the WIO there is a need for suitable geographically resolved information to identify and implement a network of MPAs, including offshore areas such as those occupied by coelacanths. The understanding of energy flow and trophic interactions in marine ecosystems in the WIO and connectivity studies are needed for the utilization and management of shared resources and systems. These biodiversity patterns and ecosystem processes need to be recognized, understood and managed effectively in order to avoid loss of biodiversity and a breakdown of ecosystem integrity. In essence, the coelacanth ecosystem is part of a larger continuum which needs to be understood; studies of the deep ecology will advance that understanding.

#### **Goals of the marine ecology: biodiversity**

- In order to understand coelacanth ecosystems, and the relationship of deep reef communities to coelacanths, develop a team of highly skilled professionals which aspires to and achieves excellence in: marine taxonomy and biodiversity studies, marine reserve science, telemetry, stable isotope analysis, fisheries impacts, ecological modelling and monitoring
- Conduct biodiversity surveys and develop knowledge of taxonomy and distribution within deep (coelacanth) reefs,
- Develop the data to support the design and implementation of an appropriate network of marine protected areas and the policies to safeguard coelacanths (both inshore and offshore MPAs)
- Make ecosystem based information available to those responsible for park management.
- Conduct a threats analysis in order to prioritize research and management actions of deep reefs, particularly those that are inhabited by coelacanths.

#### **Achievements of the marine ecology: biodiversity**

ACEP has confirmed that the region is particularly rich in biodiversity, much of which is unknown, yet the biomass that is supported by the region is small.

Deep reef transects, surveys and sampling have led to improved understanding of deep reef ecology, to pioneering research in systematics, habitat characterization, bioregions, fisheries and ecological interactions. Many new species have been discovered which have been sent to taxonomists and accessioned into the most appropriate museums, habitat definitions are developing. Several papers are in press or being submitted.

- First exploration of submarine canyons and deep reefs in terms of biodiversity and community structure.
- Identification of habitats and depth zonation patterns. Quantitative data on fish.
- New records, new species in many phyla
- Standardized large scale surveys of deep reefs in the WIO
- First study of effectiveness of GSLWP for reef fish

### **Present status of the marine ecology: biodiversity**

The marine ecology programme should be one of the largest components of ACEP, but at present it is staffed by only one person, who is also responsible for coelacanth studies (the Stable Isotope Analyses are being considered separately). It is also currently under resourced in terms of running costs and equipment. Although this section is achieving more than several people might, this component is operating at about 15% of where it should be. At present there is only one student in this component, though the scope and student enthusiasm is great. The resources to support additional students and staff in 2004 and 2005 were not available and ACEP relied on volunteers.

### **Evaluation of the marine ecology: biodiversity**

Deep reef ecology is poorly understood and not well studied because of the difficulties and costs of doing so. SCUBA diving to the depths that really qualify as deep reefs is costly, dangerous and provides a short time on the bottom, resulting in limited returns on investment. Regular access to ROVs, submersibles and support vessels is necessary if ACEP is to achieve as it should. It is stressed that given the resources and her circumstances, what has been achieved is an outstanding accolade to Dr Sink.

### **Recommendation / marine ecology: biodiversity**

An investment in a team, through added staff, technicians and students is essential. Equally, they need the finances and infrastructure to operate.

### **C4- Special note on biodiversity studies: Stable Isotope Analyzes**

Stable isotope ecology typically refers to the use of stable isotopes to determine the relative trophic positions of organisms within a food web. By determining the isotopic composition of consumers and producers, it is often possible to reconstruct the whole foodweb, determine the relative importance of key food species and the sources and flow of energy and organic matter that 'drive' the system. The traditional approach is through development of energy flow webs, which is enormously more time consuming and less accurate.

Lately, with the development of new techniques and an exponential increase in stable isotope data from around the world, it has become possible to determine animal migration patterns, previously unknown spawning, feeding and breeding sites, to determine the origin of stocks or individuals and to delineate populations.

A good example of the use of stable isotopes may be found in the study of the coelacanth. Due to the high conservation status of this species, it is not possible to sacrifice individuals to determine their food (through gut content analysis), and habitat requirements. Nonetheless, in order to effectively protect the species, information on the diet, habitat use, migration and feeding grounds is required.

Stable isotope analysis of skin-scrapings from scale samples and potential food species in the surrounding habitat should identify the coelacanth's dietary requirements and feeding locations. Using isotope analysis on micro-growth bands of fish scales, it should be possible to recreate the environment that the coelacanth inhabited and organisms that it preyed upon, in earlier stages of its life. This is of particular importance as, in order to protect the species, the habitats of both adults and juveniles need to be conserved. To date, however, no juvenile coelacanths have been recorded and without further investigation it is unlikely that habitats of juveniles can be identified. Recent advances in technology and our understanding of spatial variability of stable isotopes should be able to pinpoint the depth, latitude, proximity to shore and temperature and salinity that the juveniles inhabit.

Similar studies on other organisms (a variety of fish species, squids, birds and cetaceans) that have used several of the techniques, discussed above, have been highly successful in locating breeding and feeding grounds. Unfortunately, the sensitivity of IRMS (Isotope Ratio Mass Spectrometry) facilities in South Africa is not sufficient to cope with sample sizes as small as those obtained from micro-

milling fish scales. Furthermore, facilities for some of the more recent isotope techniques (i.e. compound specific analysis, sulphur and hydrogen isotope analysis) do not exist in this country. To date the majority of analyses have, therefore, been carried out in Europe (Queens University, Belfast) and would not have been possible without international collaboration.

- Historically, stable isotope ecology focused on trophic interactions between organisms to elucidate food webs and energy flow in ecological systems. Recent advances in technology (e.g. micro-sampling, compound specific analysis) have made possible much more detailed analysis including “forensic techniques”
- In the case of coelacanth investigations, SIA (stable isotope analysis) can now determine not only the trophic position and diet of individuals at the present but also their past feeding regimes, and feeding and breeding sites that were utilized during earlier parts of their lives.

#### **Explanation of Stable Isotope Analysis:**

Stable Isotope Analysis (SIA) not only permits a detailed analysis of coelacanth trophic relationships and history, it also enables analyses of the entire trophic web and energy flow of the WIO and facilitates the tracking of historic events in the life-time of short and more importantly long-lived species.

The project will make an important contribution to the biological oceanography of southern Africa. Because of the importance of the commercial fisheries of the west coast, our understanding of oceanographic processes around the country shows a heavy geographic bias. We have little information on the biological oceanography of the southern and eastern seaboard. By taking a broad-scale geographic approach, the project helps to redress this imbalance.

SIA is a cost-effective scientifically accurate manner of analysis of the oceans and its occupants of considerable benefit to management. SIA opens an enormous array of opportunities for excellence in science ranging from microanalysis of different components of the life-history of coelacanths to answering fundamental questions regarding ecosystem functioning, biodiversity relationships and living history. Huge opportunities exist to develop a regional team of highly skilled persons with the infrastructure and support base to establish an SIA unit in South Africa.

#### **Goals of Stable Isotope Analysis**

- The most important objective is to take advantage of the offer from the UK to install an IRMS in South Africa and build the team to offer the services and develop the excellence such cutting edge technology will bring.
- The proposed facility would allow for analysis of smaller sample sizes (required for scale, otoliths and POM analyses), the detection of isotopes of 5 elements (only three currently available in South Africa) and the problem-free upgrading of the instrument to include new applications (see below).
- In the short term, such a lab would provide the technology to conduct many of our current research needs in South Africa, as well as the training of South Africans in the field. In the medium to long term, links to the EERC and MSS, will assure that South Africa will have a stake in the internationally rapidly developing field of isotope research.
- The EERC and MSS are currently developing specialized instruments in the fields of biology (flow through compound specific analysis), medicine (detection of cancer causing pathogens) and forensics (tracing origin of drugs, explosives and petrochemicals). With further development of the offered IRMS facilities, the lab would facilitate many applications of SIA not currently available on the continent.

#### **The energy base of coelacanths**

- The primary objectives of this sub-component are to characterize the energy environment in which the coelacanth lives and to identify the ultimate sources of its food.



- Food webs show strong “knock-on” effects and are most unstable towards the top of the food chain where the consequences of disturbances accumulate. As a fish-eating top-predator, coelacanths will be particularly vulnerable to any perturbation of the food web. The fact that coelacanths have survived over very long periods implies that they inhabit an environment that is not only physically stable, but also biologically stable. However, it is possible to endanger coelacanths by destroying the biological framework within which they live, without degrading their physical environment.
- The scientific contribution of this study will be the identification of the food webs within which coelacanths exist. This makes a substantial contribution to management it allows us to understand the effects of short and long-term environmental changes. The sampling cruises contribute to capacity building by acting as an advanced training platform for university students.

#### **Essential points:**

- Facilities for this type of work are currently not available in SA (or probably the rest of the continent).
- SIA in Africa is hampered by lack of technological capacity and we are presently dependent on first world technology not available on the African continent.
- It is essential that the technology transfer to South Africa takes place and through the partnerships with the UK, SA assumes a position at the cutting edge of this developing technology.
- A long-term investment in SIA technology in SA is essential in which both scientists and technicians are trained.
- To these ends, our partners in the UK have offered “buy-in” in the form of cost price equipment (giving a saving of approx. GBP45 000) plus technical assistance in the establishment of a laboratory, including both installation and training at an estimated value of GB7 000. A way of taking advantage of the opportunity is necessary.

#### **Achievements:**

A top caliber scientist has been trained in the UK where he also worked through hundreds of samples and negotiated on behalf of ACEP a partnership with the Centre of Excellence and suppliers of equipment.

Samples analyzed regarding energy flow, trophic relationships in general and coelacanths are yielding data which is most illuminating and which will lead to publications in reviewed journals. Reports are available.

#### **D - Molecular biology: genetics**

The genetics of ACEP have been conducted by colleagues in Germany, but with the German subvention for ACEP drawing to a close, South Africa is now assuming a leadership role. There are two primary objectives of the work a) answer questions of considerable relevance to coelacanths and b) answer questions of relevance to other biodiversity of the WIO, particularly those which relate to management and sustainability of biodiversity and therefore are of benefit the people of the region. As with all disciplines in ACEP, capacity building is an exceedingly high priority.

#### **Goals of the molecular biology: genetics**

##### **1. Coelacanth studies**

The most cost effective way in which answers regarding the conservation status of coelacanth populations can be derived is to establish the genetic relationship of one population with another, the level of genetic variability within each population (a robust population has a broad genetic variability, an inbred vulnerable population has a narrow genetic variability) and to better understand the relationships of individuals within a population. It is possible, for example that the South African population is derived from a single pregnant female that came down the Mozambique Channel and gave birth to a number of young. Genetic fingerprinting will inform us of the kin relationships, give

an indication of genetic variability and provide strong pointers to the conservation status. These would lead to recommendations regarding management.

Genetic studies also have the potential, theoretically at least, for ACEP to look through the relatively recent “window to the past” as they can be used to trace the gene flow and indicate the relative age of certain populations and, possibly, movements and migrations within the WIO.

## 2. Biodiversity, phylogeography and management

The objective of this discipline of ACEP is to study biogeographic (between species) and phylogeographic (within species) patterns of diversity in marine and estuarine ecosystems of the WIO and the underlying processes that shape these patterns using genetic methods.

Data generated will provide information on geographic distributions of populations (i.e. identification of stocks), the extent of gene flow (migration) between different stocks, and the identification of areas where human impact should be kept to a minimum (because they are identified as important source habitats of recruits). Ultimately this understanding can be integrated into sustainable fisheries management and the conservation of marine biodiversity. Through this research ACEP will also aim to build regional capacity in the application of molecular genetic techniques in systematics and population genetics.

### **E- Genome Studies**

Whereas population genetic studies provide a window to the relatively recent past, the genome studies of the living fossil coelacanths provide a window to the much more distant past, perhaps going back millions of years. A long-term vision is to compare this ancient genome with other old and recent genomes.

#### **Goals of the genome studies**

- Training of key human resources
- Non-destructive tissue sampling
- Establishment of tissue culture cell lines
- Maintenance of tissue culture cell lines
- Sampling and establishment of new tissue culture cell lines
- Establishment of genome sequencing capacity (capital equipment and technical expertise)
- Development of bioinformatics capacity
- Genome analysis of selected chromosomal clusters with cellular and evolutionary importance
- Application of genomic data in studies on gene clusters of developmental and evolutionary importance

#### **Achievements of the genome studies**

Coelacanth samples collected from the Comoros and South Africa have yielded adequate RNA and DNA to initiate the studies, and to take the work of a student to virtual completion. A significant development relates to the culture of cells from scales collected from coelacanths at more than 100m depth off Sodwana. One paper has been published, another is about to be submitted.

### **F - Data Management and GIS**

Data and information, particularly for decision-making and guiding research, are the **most valuable product of any programme** and represent the principal currency of a return on investment. Accordingly, the manner in which they are handled, archived, and made available is crucial to the success of both projects. Information flow must be facilitated within the programme, and knowledge must be made readily available to the entire marine community.

Spatial, or geo-referenced, data from each of the ACEP disciplines are integrated into a Geographic Information System (GIS). This activity is fundamental to the programme as it provides a vehicle for the management of information, through integrating data from many sources and allowing a single

entry point to query and interrogate large and complex data sets. Information dissemination is as important as management and archiving, and for this purpose, raw data, interpreted data and spatial data within the GIS framework needs to be made available on the Internet, with different levels of access to researchers and the public.

Aside from data dissemination, the GIS facilitates production of user-driven products and packaged knowledge for use by researchers, managers and decision-makers, for research-support, decision-support, environmental education and public awareness. This information is imperative not only for interpretation of the research to obtain a full understanding of the biophysical processes, but also to guide management, placement of parks and human activities in the achievement of primary goals of sustainability, conservation and improvement of quality of human life. The GIS provides the electronic platform to take the research to the public and to involve school children in virtual exploration of the undersea environment. It is an enormous task simply collating, archiving and integrating the data derived from the work of ACEP, yet it needs to be built on and integrated with existing data from all marine disciplines in every country of the WIO.

The highly successful regional workshop, co-hosted by ACEP (with UNDP and CoML) in October 2004, on information and data sharing in the WIO region resulted in ACEP being asked to assume responsibility for coordinating and improving data sharing in nine countries. This is a reflection of regional acknowledgement of the achievements of ACEP, and is a credit to South Africa. The responsibility needs to be taken exceedingly seriously and requires additional support beyond the simple running costs of the project requested originally. It is stressed again: data are the most important products of research and South Africa has been asked to assume responsibility for facilitating data sharing in nine countries.

#### **Goals of the data management and GIS**

- The improvement of the state of knowledge of ecosystem processes in the WIO through the identification and review of existing marine data sets.
- Strengthening and building the existing core network of scientists to promote and facilitate information sharing in the WIO region.
- The building of infrastructural capacity (technical, hardware and software) and personnel capacity (numbers and training level) to support this initiative.
- The promotion of information sharing between programmes and initiatives in the region through establishment of an accepted framework for information sharing that serves the needs of all stakeholders, building on the progress made by ACEP and other initiatives in the region.
- Animate the bathymetric maps of the Sodwana Bay canyons so that dive simulations for education and awareness are achieved
- The establishment of a Geographic Information System for the WIO, for the integration and analysis of multidisciplinary information, to serve as a decision-support tool for research (multidisciplinary research), management (of natural resources – from coastal habitats to fish stocks) and conservation (selection and monitoring of protected areas).

#### **Achievements of the data management and GIS**

- A Geographic Information System has been designed and established, currently containing 153 data layers for the WIO, including the following types of data:
- Bathymetric information (sea floor Digital Terrain Models (DTMs), contour layers, slope layers)
- Coastal topography and DTMs of coastal areas and important catchments
- Infrastructure (roads, railway lines, airports, ports)
- Human population information (Cities, towns, villages, urban areas, schools)
- Fish species distribution information (ACEP and historical data)
- Benthic community information
- Conductivity, temperature and depth information at numerous sites

- Long term data sets for temperature and benthic community structure at 11 monitoring stations
- Information from expeditions of the research submersible, the *Jago*
- Daily and mean time-series data for ocean color and sea surface temperature from satellite imagery (1km and 4km resolution)
- Coelacanth Conservation Council database of coelacanth catches throughout the Indian Ocean, as published in the Coelacanth Council Newsletters
- Historical fish collection data from the RUSI collection at the South African Institute for Aquatic Biodiversity in Grahamstown, South Africa
- Simulations of the Sodwana Bay canyons have been developed, based on GIS data, that enabled children and adults to interface with the information. These were presented at the WSSD, science festivals and schools.
- A Sodwana Bay GIS atlas was developed for the public and young learners to interact with and query information collected on the programme.
- Workshops for data sharing and GIS have been held in South Africa, Mozambique, Tanzania, Kenya, Comoros, Madagascar and Mauritius.
- A major international workshop involving 14 countries was hosted by the sub-programme in October 2005, titled: Towards a Framework for Information Sharing between Programmes and Countries in the WIO.
- ACEP has been give the responsibility for coordinating the information and data sharing and development of an information portal for 9 countries of the WIO.
- An atlas of WIO marine data is progressing well, and discussions are underway to collaborate with IOC/UNESCO for joint atlas development for the region in 2006.
- A comprehensive metadatabase has been established to describe each of the data sets in the GIS, to facilitate long-term archiving and sharing of data.
- A server has been established for the processing and archiving of remote sensed data for sea surface temperature and chlorophyll surfaces, with an online Internet portal. The next phase will be to archive GIS data on this server and expand the portal to allow searches of the GIS metadata.
- The GIS has been used for project and expedition planning, as well as to generate maps for posters, educational brochures, scientific reports, and to integrate different kinds of information to address scientific questions.
- Three GIS students registered at Fort Hare University are working with ACEP data for their Honours projects.
- A regional network for GIS coordination has been established to support ACEP activities in each partner country, with a representative on each of the National Management Committees.

## **G - Socio-economics and Indigenous knowledge**

**This is a new discipline on ACEP with enormous potential. There is already a ground swell of enthusiasm for the initiation of the practical aspects of this initiative.**

It is estimated that 56 million of the 140 million people of the WIO are dependent upon natural resources provided by the sea. Throughout the world those economies which are largely dependent upon natural resources are not robust and the people are relatively poor. Clearly, poverty alleviation, food security, sustainability, conservation and general improvement in the quality of human live are of paramount importance to the people who depend upon the resources of the region. Accordingly, all research should have relevance to the socio-economic context in which it operates, should be of benefit to human communities and promote the economy directly or indirectly. Achievement of such objectives requires a thorough understanding of the socio-economics of each locality. Community involvement, recording and use of indigenous knowledge systems are prerequisites to success. Therefore it is necessary to promote activities associated with better understanding and incorporation of these disciplines.

The East coast of Africa from South Africa to Somalia, and the Island states of Comoros, Seychelles and Madagascar have a wonderful diversity of peoples, cultures, religions and spirituality. The socio-

economic circumstances are varied and unique, yet all are to varying degrees dependent upon the sea. Their association with the sea differs, but at each locality there is a wealth of local and indigenous knowledge. All countries on ACEP have embraced the idea of having a socio-economic sub-programme in which the communities and ACEP develop stronger bonds.

#### **Goals of the socio-economics and indigenous knowledge**

Hold inclusive planning workshops to establish the priorities, set targets, establish a team and develop a time-bound implementation plan.

#### **Achievements of the socio-economics and indigenous knowledge**

An initial planning workshop was hosted at the NRF in 2004. A likely champion has been identified to co-ordinate with the project.

### **H - Environmental Education and Learner Programmes**

In South Africa, and indeed Africa as a whole, the recruitment of young people into science is at a lower level than is desirable and is not meeting the needs of the nations. To address this issue, and in South Africa to meet the needs of Transformation, ACEP has a strong learner programme which a) takes the science of the programme to school children, b) uses the excitement of ships, submersibles, underwater exploration and “high tech” to inspire children, c) actively indicates career opportunities through films, demonstrations, exhibitions and printed material and d) engages children wherever it can to encourage entry into the sciences through involvement.

#### **Achievements of the environmental education and learner programmes**

Workshops in every country visited by the FRS *Algoa* and in Kenya have led to the development of a regional network of environmental education specialists who will co-operate to promote the learner programmes in each country and regionally. The environmental education team on ACEP is tiny, yet very active, exceedingly productive and enjoying a high profile. It has achieved acclaim in South Africa and now plays a prominent leadership role in many of the national marine environmental education and learner initiatives.

Some of the activities which represent achievements in reaching young people are presented in a numerical manner in the table 4:

*Table 4. Reaching young people*

<b>Activity</b>	<b>Numbers</b>
Interaction with scholars - visiting the ship - in the classroom - visiting ACEP exhibitions	414 410
Schools involved in ACEP activities	1907
Interaction with educators : on the ship, in one on one instruction or in teach the teachers workshops	7099
Exhibitions of ACEP (including high profile events such as WSSD)	32
Children visiting manned exhibitions of ACEP	163,232
Workshops, conferences and teacher training meetings nationally and internationally	42

#### **Evaluation of the environmental education and learner programmes**

This section has achieved exceedingly well and has won praise from national and international educators who are competent to judge. Those who run the section are thorough professionals who work well beyond the call of duty.

## **I - Communications, public awareness and the Web**

Bridging the gap between science and the public (public awareness) and incorporating new discoveries of science and the environment into training programmes for children and adults (environmental education) are imperatives of all well rounded programmes. Public awareness activities provide the means by which programmes communicate to the public and stakeholders to fulfill objectives of providing information, feedback, awareness of issues and raising the profile of the work.

Communications are probably the most important components of ACEP in terms of taking the excitement and discovery of science to the public and direct stakeholders. Internal communications within ACEP are necessary to maintain a team that is spread from Cape Town to Nairobi and the Western Indian Ocean Island states. ACEP also has important stakeholders in Asia, Europe and North America.

### **Achievements communications in general**

A high national and international profile has been developed in the media, the web has been developed (and is currently undergoing major revision), conferences and workshops have been attended and hosted, and public lectures have been presented in nine countries.

*Table 5. A numerical indication of communication activities and student participation.*

<b>Item</b>	<b>Number : Feb 2002 – Feb 2005</b>
Printed articles	303
Media interviews	118
Films produced (including educational)	9
Public displays	54
Public lectures (National and international)	129
Speeches (by Ministers, Deputy Ministers, Director Generals and High Commissioners)	9
ACEP Posters	43
Conferences and workshops arranged	31
Conference or workshop participation by ACEP personnel	36
Publications: books, reports, brochures	39
Students involved in ACEP activities	98
Students supported/qualified for degree courses	7

### **Communications Web Site**

ACEP plans to run most of its communications and business through the Web Site.

#### **Goals**

- To create an effective web presence for ACEP.
- To communicate the excitement of ACEP to the public using the site.
- To improve communications within the ACEP and with the broader global community.
- To provide an accessible, information-rich resource to people around the world.
- To present additional information to supplement printed documentation.
- To use the web/internet to address the majority of the ACEP's administrative tasks.

#### **Achievements**

- Website established.

- “Almost live” daily coverage (Blog) of March/April 2003 cruise generated a lot of interest and a keen following; March/April *Jago* cruises in 2002 and 2003 had regular updates from the ship.
- Installation of a Content Management System (CMS) to simplify collaboration on the website.
- Establishment of a hierarchy of users to enable access to documents to particular groups within the Programme, making document sharing easier but at the same time relatively secure and providing a web-accessible “digital library” of programme documents. Given the distributed nature of the Programme, this is invaluable.
- Set up of a server to house and serve remote sensing data for the region (in progress).

## 6. Capacity Building

Unquestionably, the need to build capacity in South Africa and the partner countries is the greatest overriding imperative. In terms of potential ACEP is powerfully placed to build capacity in every discipline it embraces, and through the programme's multidisciplinary and the process-orientated approach, encourage all participants to think more broadly than their own specialty.

In his State of the Nation address of 2001, and on several occasions since then, President Thabo Mbeki has identified the need to build capacity and the skills base to serve South Africa, particularly in science, where he emphasized mathematics. The same sentiments have been echoed by various Ministers. South Africa is not alone in the need to build capacity in science; the same is true of all African states. The need to build a critical mass of marine scientists, particularly for offshore, deep water studies is acute (ACEP has several documents which describe the need for more offshore marine scientists, primarily in oceanography). ACEP adopted an aggressive approach to capacity building by using the high profile of the project, the excitement of ships, submersibles, exploration and excellence to attract people.

To enable people to express their capabilities and excel in science it is necessary for them to choose careers in science, but they will not do this unless they are attracted to the sciences, environmental conservation and learning programmes. They will also not enter these disciplines unless there is a secure rewarding career for them and the infrastructure to embark upon their chosen fields. On the one hand there is a need to attract young people to the sciences and related marine disciplines. On the other, once they have entered these disciplines they need to be retained and not lost to other continents as part of the "brain drain", or because they forsake science due to disillusionment arising from lack of support and the poor salaries.

Building capacity therefore depends on four essential steps which are also goals:

### Goals of capacity building

*Attain* - Encourage young people of Africa to become excited by science and so inspired that they study science at schools and enter universities or technical training colleges in order to follow science. One of the best ways to achieve this is to use an exciting flagship project, such as ACEP, to capture their imagination. To **attain** this children are exposed to the science, ship, submersibles, the sea, fun and the environment (see environmental education above).

*Train* - Once attracted to the disciplines, it is necessary to **train** them so that they are encouraged to assume careers in marine sciences and conservation.

*Retain* - To **retain** them in science and environmental careers it is necessary to build infrastructural and institutional capacity where they can practice within the fields for which they were trained, and

*Sustain* - Once they are employed, it is necessary to **sustain** them and their interests by building the financial capacity to provide secure and rewarding careers.

The need to **attain, train, retain** and **sustain** has become a ditty which reflects a fundamental goal in ACEP of all countries.

### Achievements of capacity building

- The capacity building needs of every country have been established
- A capacity building plan has been developed
- The communications, environmental education and learner sub-programmes have achieved well in terms of **attaining** interest and inspiring young people in every country (see table 4).
- The number of students involved in special training components, informal training and formal training is given in table 6:

*Table 6. Capacity building.*



<b>Training</b>	<b>Number of students</b>
Ship-board activities	70 (51 female),
IS	6 (3 female)
Journalism	11 gender not recoded
Post-graduate MSc PhD	9 (5 women)
UFH Honours projects	3
Oceanography technical diploma	1 woman

## **HARMONISATION THROUGH SYNERGIES, COMPLEMENTARITIES AND RATIONALISATION.**

**Maputo, January 2005.**

There are a number of existing and prospective projects within the Western Indian Ocean (WIO), each with its own objectives and each contributing to the ultimate long-term sustainability of the system. Given that resources are limited there is a need to harmonize programs so that synergies are achieved which circumvent duplication, which use capacity optimally and use resources wisely. Similarly, there is a need for existing and new projects to become complementary, supporting each other in a manner which benefits the region. There are also opportunities for rationalization in which certain responsibilities that might be duplicated within two or more projects are assumed by a single project. This document provides an early indication of some of the areas of overlap that will need detailed attention of project planners and managers in order to achieve harmonization.

### **Existing and prospective programs**

In addition to National Projects within each country there are a number of NGO managed programs some of which are regional. Existing regional and sub-regional programs include the African Coelacanth Ecosystem Programme (ACEP), the East African Ecoregion Programme (EAME) of WWF (there is also an offshore Ecoregion Program associated with the Island States which WWF has launched or is about to launch). A meta-database which lists of national, regional and NGO projects is in preparation following the Information Workshop of October 2004, in Grahamstown, South Africa. Every country is contributing to the development of this database so that a full list of programs and projects should be available shortly. Suffice it to say that there are bilateral donor projects in the region (e.g. DANIDA, NORAD, French and more), multilateral donor projects (e.g. EU, FAO, World Bank), NGO supported projects (e.g. World Conservation Society, Conservation International and others).

### **Developing GEF projects include UNEP, ASCLMEs and SWIOFP.**

Although harmonization of all projects of the region is desirable, this initial attempt at developing synergies and identifying areas of complementarity includes only the UNEP, ACEP, ASCLME, SWIOFP and France. However, the final column in the tables below does indicate where other projects are active in specific disciplines.

The order in which the programs are presented in the tables represents, rather roughly, the association of each project with the coast of Africa and depth (UNEP being land impacts on marine ecosystems, ACEP being associated with near-shore components and parks as well as off-shore oceanography, ASCLME is slightly deeper than ACEP, SWIOFP has an overlap from shallow to deep, France is involved in the most easterly area, but is also operational in the Mozambique Channel).

The tables below indicate the activities within each major discipline which are necessary to understand and manage the processes of the WIO which sustain life, promote economic development and build the capacity to carry the WIO into the distant future.

### Key

The interest and responsibilities of projects in particular disciplines are represented by:

- +++ ..... a primary activity
- ++ ..... an important secondary activity
- + ..... an activity of importance, but not main line
- ? ..... uncertain

## 1. GEOSCIENTIFIC STUDIES

Mapping of the ocean floor is a prerequisite to understanding the topography and structural habitat, identifying trawling grounds, providing area species estimates of value to fisheries and conservation of biodiversity, providing basal layers for GIS decision-making frameworks and providing topographic information for oceanography (e.g. current deflection, routes for upwellings,) and biology (biogeographic distribution in accordance with habitat continuities and discontinuities etc). Geological studies also explain the past and provide a basis for certain predictions of the future.

### Methods

- Satellite imagery (visible)
- Side-scan sonars and multibeam bathymetry
- Ship and submersible sampling (seabed)
- Coring
- Mapping (GIS)

### Projects involved in geoscientific activities

	UNEP	ACEP	ASCLME	SWIOFP	France	NGOs and Governments
Satellite imagery	+	+++			+++	
Bathymetry maps (coast, drop-off, area-species relationships, impact on fisheries)	+	+++	++		+	++
Geology and sedimentology	+	+++	++		+	++
Geophysical Information (habitats)	++	+++	++	?	+	++
Use of maps and GIS for public awareness and interactive education tools	++	+++	++	?	+	++

## 2. OCEANOGRAPHY

The unifying driving force which governs processes within the WIO is the South Equatorial Current and the manner in which it branches northwards to Tanzania, Kenya and Somalia, and southwards to Mozambique, Madagascar and South Africa. It also impacts on Seychelles, Mauritius, Reunion and, of course, the Comoros are in its path. Physical (physico-chemical) oceanography describe the impact of currents, water quality, temperature, conductivity (salinity) on ecological processes. Data are to be collected on dedicated cruises, and opportunistically as part of other activities (e.g. oceanographic data are collected during fishing cruises), from long-term bottom placed equipment and from drifters and satellites. Biological oceanography leads to understanding and modelling of the processes in which inorganic nutrients and photosynthesis are translated into primary and secondary productivity and the manner in which energy and organisms (particularly larvae) are distributed and used within the system. These processes are of fundamental importance to management of fisheries, conservation and sustainability.

### Projects involved in oceanography activities

	UNEP	ACEP	ASCLME	SWIOFP	France	Others NGOs and Governments
<b>Physical oceanography</b>	+ nearshore and impacts of land-based activities	+++ nearshore and offshore	+++ nearshore and offshore	+ nearshore and offshore	++ + nearshore and offshore	++ nearshore and offshore
<b>Biological oceanography</b>	++	+++	+++	+	+++	++

### *Data/Information needs*

- Water quality
- Erosion dynamics and River run-offs – linked to “turbidity” dynamics and sediment (UNEP)
- Agulhas Bank and retroflection region
- Eastern Madagascan Current and Retroflection
- Coastal upwelling cells and nutrient analysis
- Genesis and dynamics of gyres in the Mozambique Channel
- Sea Level changes
- Primary productivity
- Plankton
- Nutrients

### **Methods**

- CTDs, ADCPs
- Satellite imagery (IR, altimetry)

- Drifters
- Tide gauges
- Mooring data
- Long-term monitoring probes
- Bongo nets

## 2. BIOLOGY AND FISHERIES SCIENCE

Management for sustainability of biological resources, for maintenance of natural processes and for economic development are dependent upon an understanding of the relationships of animals and plants to one another and to the physical environment in which they live. First steps are to discover what the resources are and where they are distributed (biodiversity surveys, fisheries surveys, taxonomy and habitat definitions), the extent of the resource, the interrelationships between organisms, their life-histories, general biology and their habitat tolerance ranges are among the many aspects of fundamental research which are prerequisites to informed decisions regarding management. Baseline information is necessary to measure changes that are due to natural and anthropogenic changes so that impacts of management can be assessed and modified adaptively. No single project can cope with the broad spectrum of requirements, some of which are indicated above. Clearly, existing national and regional projects need to work synergistically to contribute to long-term regional goals. Some broad categories of synergy with respect to several projects are proposed. Fisheries studies will include analyzes of stocks, their resilience and much more (see SWIOFP documents).

### Projects involved in biology and fisheries science activities

	UNEP	ACEP	ASCLME	SWIOFP	France	Others NGOs and Governments
Food webs	+	+++	+	?	+++	?
Bioundicators of ecosystem state	+++ Seabirds Turtles, others?		+++ Seabirds Turtles, others?	?	+++ Seabirds Turtles	?
Life histories	+	+++	+++	+++ mature stages?	++	++
Biogeography and habitat definitions, connectivity	+++	+++	+++	+++	++	++
Biodiversity surveys (taxonomy, identification of “diversity hot spots”)	+++	+++	+++	+	+	++
Biotelemetry (tagging)	++	+++		++	+++	++
Genetics	+	+++		+++	+	
Genome studies	+	+++				
Fisheries (see	++	+		+++	+++	+++

SWIOFP documents)						
FADs	++			+++	++	+

*Methods*

- Satellite imagery (sea colour, altimetry)
- Acoustics (multi-frequency)
- Sampling (various fishing methods, dredges, grabs, traps, transects, video and photographic)
- Genetics (population genetics, variability, finger printing, phylodistribution)
- Trophic ecology (stable isotopes, gut contents, energy flow)
- Seabird tagging and population monitoring
- Manned submersible, ROV, SCUBA
- Biological transects and census

**4. CAPACITY BUILDING**

It is of utmost importance for sustainability that the capacity of the region is developed to build on the platform laid by the projects, carrying the issues into the future. ACEP defines capacity building as encouraging interest and entrance into the disciplines (Attain). Then there is need to train personnel, the need to build infrastructure and institutional capacity to retain those who have been trained in a capacity that enables them to perform the activities for which they have been trained (Train and Retain). And, last, there is need to build the financial capacity to sustain the activities (Sustain). The adage “Attain, Train, Retain and Sustain” is used to describe these four components. However, for the purpose of this discussion, only the training elements are considered; future prospects for those trained must however be borne in mind if we are truly to “build capacity” and not simply train people who are not then able to carry on in the disciplines in which they are trained within the region (which is not the essence of capacity building; training is just one part of true “Capacity Building”). All too often the focus of “capacity building” falls solely on students and not on ensuring that those students have the opportunity to pursue a career (and benefit the region) within their field of expertise, indeed they are frequently forced to leave the region to follow their career or enter non-scientific careers and are thus a “loss” to the system. This is a symptom of short-term funding cycles, where achievement in “capacity building” is measured only by numbers of students trained, and not in an actual increase in functional capacity for the country or region. To truly build capacity requires long-term vision and financial and institutional commitments (50 year cycles).

In terms of developing excellence and leadership in the different disciplines, a need is seen for MSc and PhD training. A prerequisite to these higher degrees would be sponsorship of undergraduate degrees. Additionally, a number of special courses, which are not part of the formal degree courses of educational institutions, are envisaged. Clearly, there is a need for training to be both complementary and synergistic between projects.

**Commitments to Training Objectives**

	UNEP	ACEP	ASCLME	SWIOFP	France	Others NGOs and Governments
PhD	+	+++	+++		+++	++
MSc	+	+++	+++	++	+++	++
Undergrad	+		++	++		+++

Special courses	++	+++	++	++	++	?
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## 5. PUBLIC AWARENESS, ENVIRONMENTAL EDUCATION

Bridging the gap between science and the public (public awareness) and incorporating new discoveries of science and the environment into training programmes for children and adults (environmental education) is an imperative of all well-rounded programs. Public awareness activities provide the means by which programs communicate to the public and stakeholders to fulfil objectives on providing information, feedback, awareness of issues and raising the profile of the work.

Environmental education refers to formal and informal learner programs, including television, radio, printed material, teacher training, exhibitions, interactive opportunities, science fairs which are either extra curricular or which contribute directly to educational curricula.

By encouraging an interest and curiosity in the world around them, public awareness and environmental education indirectly contribute to capacity building by attracting people to science at an early age.

### Commitments to Public Awareness and Environmental Education

	UNEP	ACEP	ASLME	SWIOFP	France	Others NGOs and Governments
Public Awareness	+++	+++	+++	++	++	++
Env. Educatn.	+++	+++	+++	++	++	+++

## 6. SOCIO-ECONOMICS, INDIGENOUS KNOWLEDGE SYSTEMS, COMMUNITIES

Poverty alleviation, food security, sustainability, conservation and general improvement in the quality of human life are of paramount importance to the people who depend upon the resources of the region. Accordingly, all programs should have relevance to the socio-economic context in which they operate and should be of benefit to human communities and promote the economy directly or indirectly. Achievement of such objectives requires a thorough understanding of the socio-economics of each locality. Community involvement, recording and use of indigenous knowledge systems are prerequisites to success. Therefore most programs do support activities associated with better understanding and incorporation of these disciplines.

### Commitments to Socio-economics, Indigenous Knowledge Systems and Community Participation

	UNEP	ACEP	ASLME	SWIOFP	France	Others NGOs and Governments
Socio-economics	+++	+++	+++	+++	++	+++
IKS	++	+++	+++	+?		+++
Communities	+++	+++	+++	++	+	+++

## 7. DATA MANAGEMENT, INFORMATION AND GIS (DECISION MAKING)

All programs must build on previous work (i.e. analyze and take into consideration historic data), obtain, manage and analyze new data and ensure that the information developed is available to every country of the region in a secure information hub.

### Commitments to data sharing

	UNEP	ACEP	ASLME	SWIOFP	France	Others NGOs and Governments
Data acquisition & management	+++	+++	+++	+++	+++	+++
Data sharing	+++	+++	+++	+++	+++	+++
GIS		+++	+++	+?	+++	+++

### 8. MODELLING

Interpretation of ecosystem processes, particularly those associated with physical and biological oceanography and their impacts on fisheries production, as well as decisions regarding fisheries and bioeconomics can be dramatically advanced through modelling.

#### Commitments to modelling

	UNEP	ACEP	ASLME	SWIOFP	France	Others NGOs and Governments
Ecosystem	+	+++	+++	+ & b	+++	++
Fisheries	+			+++	+++	+++
Bioeconomics	+			+++	++	++