Tanzania Coastal Management Partnership

PROCEEDINGS OF THE SCIENTIFIC MEETING ON MARINE AND COASTAL ECOSYSTEM RISK ASSESSMENT

An Approach for linking Science to Integrated Coastal Management

Zanzibar 30-31 July, 1998
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SCIENTIFIC MEETING ON "MARINE AND COASTAL ECOSYSTEM RISK ASSESSMENT: AN APPROACH FOR LINKING SCIENCE TO INTEGRATED COASTAL MANAGEMENT (ICM) PROGRAMMES" HELD AT THE IMS LIBRARY, Zanzibar, 30-31 July 1998

BACKGROUND:

The link between science and management for the successful implementation of ICM programs has been highlighted and emphasized at all levels and in numerous fora, policy statements, agreements and conventions. Scientific information is critical in defining the scale of ICM programs, elaborating selection of management options and types of management measures as well as for informing the public through awareness and educational programs

Selected case studies form a diversity of settings in developed and developing nations reveal striking commonalties in the interplay between science and ICM and demonstrate that effective ICM cannot occur in the absence of science. The natural sciences are vital to understanding the functioning of ecosystems (including the human component) and the social sciences are essential to comprehending patterns of human behavior that cause ecological damage (pressure variables) and to finding effective solutions (response measures). Scientists and managers often have different perspectives and imperatives. Nevertheless, as the case studies clearly suggest, they must work together as a team through all the stages of ICM program and reach an agreement on the scientific work needed to address priorities and guide policy development"[1].

During 1993-95, the United Nations Group of Experts on Scientific Analysis on Marine Pollution (GESAMP) commissioned a Task Force to look into the integration of science to ICM programs. The Task Force was successful in developing a conceptual framework for identifying the broad types of scientific interventions (both social and natural) required at each of the steps of the ICM process. The scientific tools which are particularly useful in generating information relevant to ICM include resource survey techniques, hazard and risk assessments, modeling, economic valuation and evaluations and analysis of legal and institutional framework.

However, a number of factors are impeding the effective integration of science to management resulting in poor performance (including delays) in the implementation of ICM programs:

> **First**, the diversity and complexity of the marine and coastal ecosystems and the continuous interaction among the components have consequences that disturbances in any one of the components are experienced broadly both in terms of time and geographic scales. In its endeavors, science has generated long lists of variables for collecting information especially

[1] GESAMP (IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP/ Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection), 1996. The contribution of Science to Integrated Coastal Management. Rep. Stud. GESAMP, (61):66 p.

in situations where scientists are not collaborating with managers in setting/selecting the issues most relevant for management. Often resulting in a protracted scientific process which frustrates the implementation of ICM programs. There is, in this respect, a dire need for developing an objective and scientific approach/protocol to facilitate prioritization of issues which science should address.

Second, the scientific approach employed during the ICM issues identification stage has concentrated more on the state of the natural ecosystems- identifying the damage and disturbances of the ecosystem. In most cases programs have entered into the planning stage without taking proper stock of the pressure on these ecosystems imposed by the different resources uses or at most using only deductions from the state of the natural resources.

Third, the scientific information is presented in a manner that is too complicated for easy understanding normally in scientific journals which are not accessible to many that deal with coastal management. It is important that procedures are developed which can facilitate and ensure balance and synthesis of scientific information into coastal policy/management options and advises.

There exists now, in the developed world, capacities and technologies able to facilitate the integration of marine science and coastal management. For example, the Environmental Protection Agency (EPA), United States, has, for the past two decades, been developing an ecological risk assessment protocol. Dr. Jonathan Garber, EPA, has been invited by Tanzania Coastal Management partnership to, among others, meet with key coastal research groups to familiarize with on going coastal monitoring programs and to discuss on how to integrate science into ICM programs. Rather than meet with individual research groups it is proposed to hold a scientific meeting drawing representation from the different research disciplines.

PURPOSE:

The purpose of this two-day meeting was to:

- Present the ICM Policy cycle and elaborate on Step 5 “Monitoring and evaluation";
- Present systems for coastal and marine environmental assessment, monitoring and reporting;
- Review marine and coastal environmental issues identified by TCMP Core Working Group;
- Suggest management questions for the issues that could be answered by the scientific community;
- Introduce the report card concept and process; and
- Develop a strategy for demonstrating assessment, monitoring and reporting on two specific issues.

PROCESS:

The scientific meeting was divided into three sessions:

- Theoretical part during which the concept of marine and coastal ecosystem monitoring for risk assessment was presented and discussed.
- Reflection and discussion on the issues identified by TCMP's Policy core working group.
- Development of a strategy and program institutionalizing a monitoring and analysis program for two selected issues for demonstration.

SESSION ONE

Opening remarks: Dr. Julius Francis, Director, Institute of Marine Sciences

Institute of Marine Sciences research activities are mainly oriented towards understanding, managing, utilizing and conserving marine and coastal resources. In addition to direct research activities, the Institute also plays the role as a facilitator and provider of information to other academic, governmental and non-governmental bodies in areas of marine environmental policy development, socio-economic and environmental economic, training and education as well as international and regional co-operation and networking.

Advisory Role of IMS is guided by the following principles:

- The advice offered is based on concrete and best available scientific information
- The appropriateness and adequacy of the information
- Role of research in assessing the effectiveness of policies/ measures

IMS recognizes that both national and international marine research is characterized by:

- Absence of priority setting mechanism for research
- Most research is single discipline
- Poor dissemination and communication of research results

IMS strives to move form problem identification to solution by emphasizing:

- Cost effective alternatives in conducting research
- Pilot programs to test ideas
- Marketing of workable solutions
- Precautionary approach

ICM Policy Cycle: the need for program evaluation and assessment for learning, By Elin Torell of the University of Rhode Island, Coastal Resources Center

At its 1996 meeting, the international Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) identified learning from Integrated Coastal Zone Management (ICZM) experience as a priority emerging issue:

There is an urgent need for an accepted integrated coastal management (ICM) evaluation methodology.... When an evaluative framework is in place it will be possible to document trends, identify their likely causes and objectively estimate the relative contributions of ICM programs to observed social and environmental change

The project discussed here is designed to contribute to the development of a common methodology for learning and sharing of experience between Coastal Management (CM) initiatives. Such a common methodology will hopefully facilitate learning both over time and between projects. At present most management systems are out of tune with large-scale cycles of ecosystem change. Planning and management of coastal resources usually has a time span of (at the best) 4-5 years.

The knowledge of the context prior to that time is often poor. Another factor is that environmental management often is carried out in an ad hoc fashion on a local scale, with little connection to national or regional management needs. By adopting a learning based approach to coastal management, where the management systems are adaptable and open to new knowledge, and where local projects feed into the national coastal management plan, there is a larger possibility that the individual projects will lead to sustainable ecosystems. The concept of learning from experience is closely related to the conceptual framework of adaptive management, developed by C.S. Holling in the 1970s.

...[Adaptive Management] requires flexible, diverse, and redundant regulation, monitoring that leads to corrective responses, and experimental probing of the continually changing reality of the external world. (Holling in Gundersen et al. 1995: 30)

Public participation, as part of a functioning democratic decision making process, is one of two pillars in adaptive management. Public participation ensures that learning will be at maximum, political conflict can provide ways to recognize errors, complementing and reinforcing the self-conscious learning of adaptive management (Lee 1993: 87). The second pillar in adaptive management is reliable knowledge gained by learning from experience. In order to attain reliable knowledge, baseline indicators have to be established, and thorough qualitative studies need to be carried out prior to any intervention.

One essential feature of adaptive management is to do periodical evaluations of projects. The purpose of such evaluations would be to track the progress that a project has experienced over the last period, and to identify changes that would make the project work better. There are several kinds of evaluations:

- **Performance evaluation:** The quality of project implementation and the degree to which the project goals are achieved are measured.
- **Outcome assessment:** Measures the impacts of a Coastal Management (CM) initiative upon coastal resources and for the associated human society.
- **Management Capacity Assessment:** Determines the adequacy of management structures and governance processes as these relate to the goals and objectives of the project. The purpose is to improve the project design and make adjustments to the internal workings of a project, and to track the forward progress in coastal management. (This is the focus of our work).

In order for an evaluation to be successful, it is important to benchmark ecosystem health and the status of project governance. If the context at the point of departure of a project is not known, it is more or less impossible, to measure the progress of the project.

The Coastal Resources Center has developed a manual for self-assessment, which has the purpose of measuring progress over time and to facilitate improvements of the governance process. The goal with this manual is to promote learning within and across projects. The manual will hopefully facilitate the transfer of knowledge, and increase replication of good practices while reducing the tendency to "re-invent the wheel" with each new project. Another goal is to achieve a greater ownership of coastal management initiatives within governments and among local stakeholders.

The governance process of a coastal management initiative can be described as consisting of five steps:

1. Identification and analysis of national, regional or local coastal issues

2. Plan or program preparation
3. Formal adoption and funding
4. Implementation
5. Evaluation

The plan for the first part of this project is to assess the status of the national CM programs and the various individual CM projects in mainland East Africa in accordance with the essential actions associated with each step of the policy cycle. A second goal is to define issues of significance to the benchmarked programs and projects. In a second phase, the self-assessment manual will be applied in three-CM projects in Tanzania.

Assessment and monitoring of coastal and marine ecosystems to inform ICM programs: Dr. Jonathan Garber - USA Environmental Protection Agency

The theme of Garber's presentation was the importance of bridging the two pillars of coastal zone management – governance structures and reliable knowledge. Building from this concept, Garber introduced CRC's concept for measuring progress in governance and reliable knowledge base in ICM in the forma of a graph with a while and blue line. The white line measures progress in developing governance structures and the blue line measures progress in terms of environmental conditions. The focus of the presentation was the second pillar – reliable knowledge. He briefly outline the framework of Ecological Risk Assessment (ERA), as now proposed in the U.S., as one structured process for addressing complex environmental issues and providing reliable knowledge to decision makers. The key points related to ERA include:

- Assessing environmental conditions ("ecological health") at larger scales of time and space.
- Community based (bottom-up) decision-making in conjunction with command-and-control (top-down) regulations.
- Importance of comparing relative risks to human health and ecological systems.
- Assuring risks and benefits are equitably distributed.
- Assessing the environmental effectiveness of management actions.

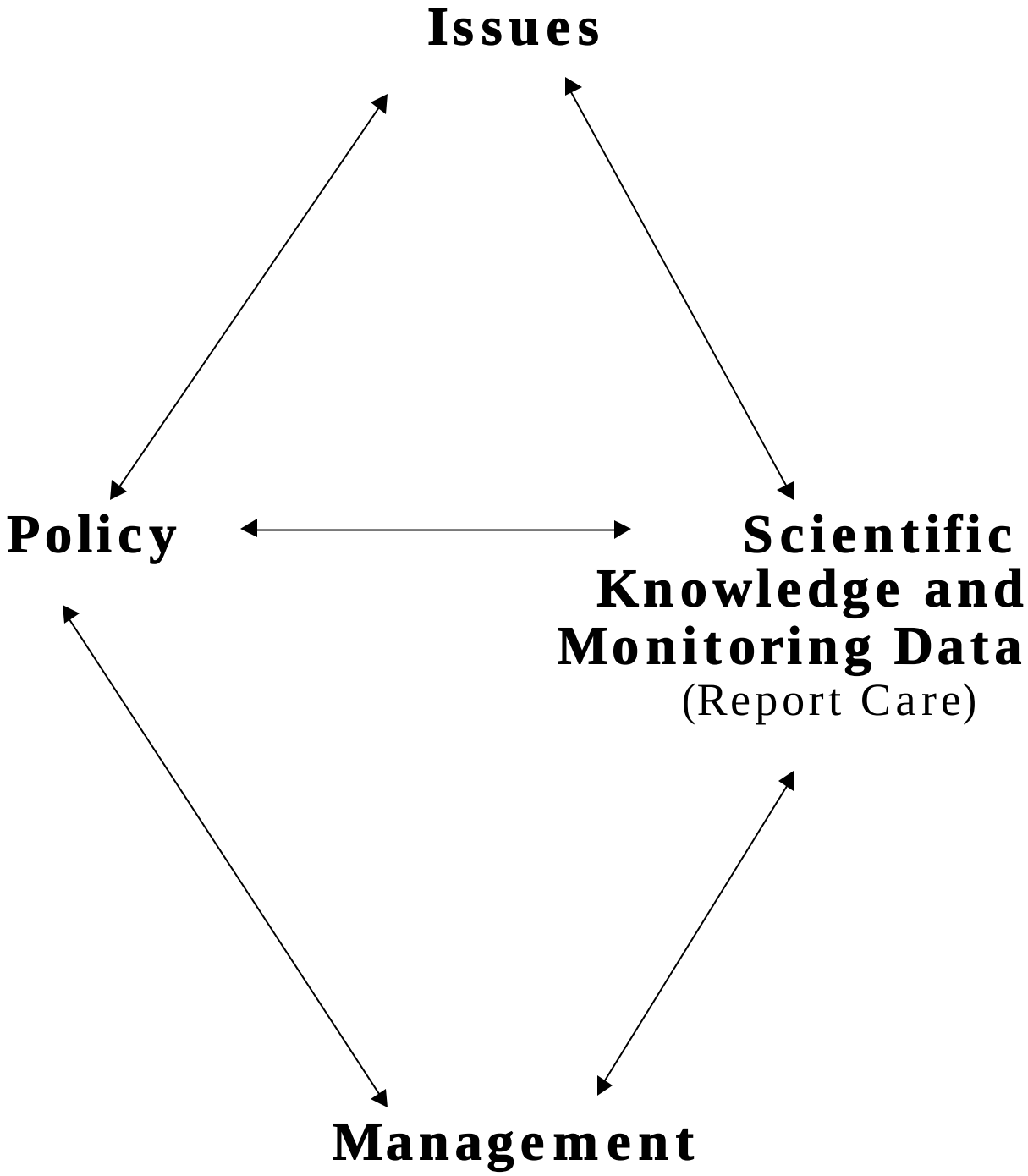
He then proceeded to make the point that coastal environmental monitoring programs do not have to be fancy, complicated and expensive to be good. The point was provided the transition to the outline and characteristics of an Environmental Report Card developed and used by the USEPA's Mid-Atlantic Integrated Assessment (MAIA) Program at AED. The discussion then moved to the sequence of six major steps involved in developing a report-card-like reporting system:

- Choosing the issues, problems, resources or "concerns."
- Choosing which places, or classes of places that are "representative" or generalizable to similar places on the coast.
- Developing accurate indicators to assess the ecological condition or "state" of the resource or problem.
- Establishing criteria for good, average and poor condition.
- Assembling, analyzing, synthesizing the data.
- Communicating the "Report Card" to the appropriate audiences.

Figure 1 puts these Key Actions into graphical form and highlights the interdependency of Science & Policy.

Figure 1

Framework for Monitoring ICM Issues



SESSION TWO

Coastal management issues identified by TCMP working groups: Jeremiah Daffa - TCMP Support Unit Leader

In his presentation Daffa briefed the workshop on the establishment of the Tanzania Coastal Management Partnership (TCMP), its goal, targeted results and working approach.

He explained that TCMP was a partnership initiative between the Vice President's Office through the National Environment Council (NEMC) and the United States Agency for International Development (USAID) and the University of Rhode Island's Coastal Resource Center (URI/CRC).

TCMP Work Plan

TCMP was established through an in-depth and extensive consultative study in 1996. The study highlighted the need to link for an overall framework that supports coastal management at the national and local level. The study also outlined the key challenges for successfully implementing ICM in Tanzania. The challenges include:

- The lack of policy and regulatory clarity to guide ICM planning and decision-making at both the national and local levels;
- The lack of clear and mutually supportive linkages among national, local and private sector initiatives in ICM;
- The lack of human and institutional capacity for ICM at all levels; and
- The lack of direct linkages between ongoing ICM implementation activities and national policy.

The TCMP was designed to address these concerns by working towards the following results:

- the formulation of meaningful ICM policy that is effectively applied to coastal problems at both the national and local levels - the TCMP will work towards identifying and describing key coastal management issues that the government should address in a national coastal management policy/program.
- the definition and application by government, business and communities of sustainable practices for emerging coastal economic opportunities - Mariculture will be the initial issue addressed in years one and two. Mariculture was selected as the initial area of focus because of its rapid emergence as a coastal issue and economic opportunity and the recognized need to consider Mariculture development within a broader ICM context.
- mechanisms put in place to facilitate national support of effective local ICM; the TCMP will conduct all local interventions through the existing programs to ensure that its goals and activities are in harmony with planned activities in the field.
- increased institutional and human capacity for ICM - the preparation of an ICM short course that will be conducted in year two. This short course will be the first of its kind in Tanzania and in the region that will bring together a range of disciplines to learn about the practice of coastal management. TCMP will also focus on providing its partners ample opportunity for learning by doing augmented, where appropriate, by short courses both in Tanzania and outside.
- improved understanding of and support for ICM in Tanzania- Tanzania also has a strong network of ICM field programs that are actively testing ICM approaches. The TCMP will serve as a vehicle for gathering this experience and sharing it with both internal audiences (within Tanzania), regionally and globally.

The TCMP's activities are divided in two phases with Phase One (1997-1999) putting emphasis on learning from existing experience, policy articulation, development and testing of sustainable practices, and building the processes, constituency, and structures required for sustainable coastal governance. Phase two (2000-2001) will concentrate on making initial progress on testing, applying and refining coastal policy.

TCMP Approach

The TCMP will achieve these results only through close collaboration with the existing network of ICM programs and practitioners, local government officials and the coastal community to facilitate a participatory, transparent process to unite government and the community, science and management, sectoral and public interests to wisely conserve and develop coastal ecosystems and resources with the main goal to establish the foundation for effective coastal governance and management.

Key attributes of the TCMP and its approach

TCMP is flexible – TCMP has used a consultative process in the design of the project to date, and the project can be modified as it proceeds. At this early stage, there is still opportunity to vary proposed activities.

TCMP is results and process oriented – The TCMP will strive to achieve measurable results that have been agreed upon by the partners and employ an open, participatory and transparent process for achieving those results.

TCMP has a long-term orientation – Beyond the five-year results framework, the TCMP wants to ensure that integrated coastal management in Tanzania is sustainable over the longer term.

TCMP is participatory – Participation of the partners is critical to the success of the TCMP. From design to final evaluation, the TCMP will strive to include the appropriate range of stakeholders from all levels of government, private sector, NGOs and CBOs in its deliberations and decision making process.

The primary engine for the TCMP are Interagency Working Groups that draw from Tanzania's existing experience and expertise including representatives from key government, public and private institutions. The Working Groups already formed by the TCMP include the Core Working Group (CWG) and the Mariculture Working Group (MWG). An Socio-Economic Team (SET) and Legal Team (LET) supplement these. Other groups will be formed later as the process requires them.

Coastal Management Issues Identified by TCMP Working Groups

The TCMP Core Working Group (CWG) and the Mariculture Working Group (MWG) identified a number of issues pertinent to ICM. The issues range from destructive resource use, land use planning and issues non-biophysical. For the purpose of the scientific meeting, Daffa named the following specific issues for discussion.

1. **Destructive Resource Use**
   - Dynamite Fishing
   - Coral mining (lime, construction, ornamental etc.)
   - Use of destructive fishing gear (*Juya, Kavogo*)
   - Use of poison in fishing
   - Capture of turtles
   - Collection of sea shells

2. **Land Use Planning**
   - Settlements
   - Agriculture Practices
   - Allocation of beach plots
   - Salt Works
   - Sand extraction / quarrying

3. **Unsustainable use of Mangroves**

4. **Coastal Erosion**

5. **Pollution**
   - Industrial
   - Domestic
     - Agriculture
     - Oil Pollution

6. **Issues Non Bio-Physical**
   - Information collection and sharing system weak
   - Enforcement of existing laws
   - Lack of capacity and equipment
   - Land Tenure
   - Marketing for Mariculture products (e.g. sea weed)
   - Coordination between sectors is poor (esp. in areas without projects)

7. **Mariculture Issues pertaining to No. 1, 3, 5**

Formulation of management questions in small groups

Instructions for Groups:

Translate the issues identified by TCMP Core Working Group into management questions to which scientists can relate

Coastal Erosion

1. What are the causes of coastal erosion?
2. What is the extent of the problems?
3. How can we monitor the problems?
4. How can we scientifically manage the problem?

Notes

1. a. Natural causes
   b. Anthropogenic causes
2. a. Are the problems localised or transboundary?
   b. What are the socio-economic impacts?
3. a. What are the Indicators?
4. a. What are the mitigation options?
   b. What are the experiences elsewhere?
   c. What are the cost implications of mitigation
      Versa viz. the value of the property/area?
   d. What is the cost of the strategy?
   e. Do we have the capacity to manage the problem?
   f. How is the solutions/mitigation measure going to affect the current use of the area?

Pollution

1. What are the sources of pollution?
2. What is the extent of the problem?
3. How can we monitor the problems?
4. How can we scientifically monitor the problems?

Notes

1. a. Point source
   b. Non point sources
2. a. What are the risks?
   b. What are the standards?
   c. Are the problems localised or transboundary?
   d. What are the socio economic impacts?
3. a. What are the indicators?
4. a. What are the mitigation options?
   b. What are the experiences elsewhere?
   c. What are the cost implications of mitigation
      versa viz. the value of the property/area?

d. What is the cost of the strategy?
e. Do we have the capacity to manage the problem?
f. How are the solutions/mitigation measures going to affect the current use of the area?

Land use planning

1. Settlement and Allocation of Beach Plots, what are the criteria for allocating the area for:
   - Hotel
   - Infrastructure and amenities
   - Industries
   - Residential
2. Agriculture Practices:
   - What levels and effects of fertilisers, pesticides and herbicide from agriculture reach the marine environment?
   - Which pesticides and herbicides are prohibited?
   - Where agriculture should be taking place?
3. Salt Works:
   - What is Extent of areas used for salt work?
   - What Impacts on the environment and economy?
   - What are the possibilities of minimising the effects?
   - How do we rehabilitate or restore the abandoned areas of salt production?
   - What alternatives for salt production?
   - What cost for alternative salt production?
4. Sand Extraction/Quarrying:
   - What areas to get the sand and quarry?
   - What are the impacts on the environment and economy?
   - What alternatives to replace the sand and quarries in building?
   - What is the possibility of minimising the effects?
   - What are the possible alternative livelihood?
   - How do we restore the abandoned areas?
5. Land Tenure:
   - What projects are intended for the given land for the period of ownership?
   - How do we give the value of land?
   - What ecological inputs on the environment?
   - What type of development has to interfere with environment and socio-economic aspects?
   - What conflicts for land allocations?

Unsustainable use of mangroves

- What are the baseline information on the potential of mangroves?
- What are the ecological impacts?
- What buffer zone for harvesting resources in the mangrove ecosystem?
- What are the restoration or rehabilitation measures of destroyed areas?
- What are the alternative use of mangrove trees?
- What can we learn from the community-based management of the conservation of mangroves?
- How are the users of mangrove and at what levels?

Dynamite fishing

- To what extent is dynamite fishing being practised in Tanzania in terms of geographical scale and intensity?
- What is the scientific definition of dynamite fishing?
- Why fishermen use dynamite fishing?
- What is the effect of dynamite fishing to the environment (indicators)?
- What data do scientists have to justify the destructiveness?
- Is it possible for scientists to find alternative ways to stop the fishermen using dynamite fishing (e.g. aquaculture) since the fishermen need to survive?
- Are the people using it aware of the problems they are causing or not?
- What can the scientists do to restore the areas blasted?

Coral mining (lime for construction, ornamental)

- Where is coral mining practised in Tanzania?
- Why do people mine and for what?
- Where is mining conducted, in the sea or on land (its extent)?
- What ecological effects does coral mining have on the environment?
- Any research work has been conducted to look at the impact?
- What species of coral are mostly affected?
- What alternatives can be used instead of lime?

Use of destructive gears (kavogo, kigumi, kokoro, beach seine etc)

Same as dynamite and also:

- Which gears are destructive?
- What is their destructiveness?

Use of poison

- What poison is used?
- Where do they get it?
- Where and how do they apply it?
- What are the pathological impacts?
- What are the ecological impacts?

Shell collection

- What species are extracted?
- Where are they marketed?
- Population structure of the harvested stocks
- Effect of harvesting on the environment

Turtles

- What species are being caught?
- Which seasons are they mostly caught?
- What do they catch them for?
- Where do they breed?
- Do they take eggs as well?
- What do they fish them with and how frequent? (targeted, incidental)
- Are there any cultural values attached to turtles?

Non- bio-physical Issue

1. Information collection and sharing system
    - Why is the information collection weak?
    - Does the information collected by researchers reach the stakeholders?
    - How is the information is collected, stored, and retrieved?
    - How best can the information be shared?

2. Lack of capacity and equipment
    - What is the existing situation?
    - How can we handle it?
    - What are the priorities?
    - What is the present capacity required solving the problems and what equipment is needed?

3. Marketing
    - Is the quality of mariculture products marketable?
    - What is the problem (local market or international)?
    - Was research conducted on market availability before investing?

4. Co-ordination
    - What is the co-ordination between sectors?
    - Are there any conflicting laws?
    - How best can they co-ordinate?
    - Do the sectors have a chance to meet and discuss?

5. Enforcement of the existing laws
    - To what extent are the communities involved?
    - What is the contribution of science to law enforcement?
    - Do scientists participate in the formulation of laws?

Identification of specific types of information/data needs:

Respond to management questions by identifying specific types of information that is needed to determine the extent and severity of the environmental issue in other words identify specific data needs.

Coastal erosion

1. **What are the causes of coastal erosion?**
   a. Natural causes
      - Tectonic movement
      - Wave action
      - Climate change
   b. Anthropogenic causes
      - Sand mining
      - Coral destruction
      - Mangrove cutting
      - Poor land use practices
      - Coastal development + harbour
      - Dam construction
2. **Information required:**
   a. Natural causes:
      1. Tectonic movement: - Regular collection of seismic data
      2. Geomorphology of the coastline
      3. Bathimetry
      4. Hydrographic: -Wave action, currents and tides information
      5. Time series information in coastal configuration and beach profiles
      6. Climate change: long-term monitoring of sea level change
      7. Isotopic information on sediment transport
      8. Information on seasonal changes in rainfall and wind patterns

   b. Anthropogenic causes:
      1. Sand mining sites and volume of sand extracted
      2. Coral destruction - Sites and volume of coral extracted
      3. Information on coral species, distribution and abundance
      4. Mangrove cutting - A real coverage of mangroves
      5. Amount of Mangroves and types of species harvested

3. **How can we scientifically manage the problems?**

   The information obtained will be used to set up appropriate mitigation measure.

Pollution:

1. What are the sources of pollution?
   - Inventory of sources of pollution - land based and maritime

2. What is the extent of the problem?
   - Information on types, levels and effects of pollutants
   - Information on whether the problem is localised, extensive or transboundary
   - Information on areas needing immediate attention

3. How can we monitor the problems?
   - Information on indicators of pollution
   - Time series gathering of information

4. How can we scientifically manage the problems?
   - Information on the level of pollutants that may cause stress or toxic effects

Unsustainable use of mangroves

1. **What is the extent of areas used for salt work?**
   - Location and area covered by
   - Percentage area covered
   - Topography
   - Sighting
   - Suitability of the site for salt pans construction
   - Cultural, value of the area
   - Information on canals
   - Production per unit area

2. **What are the possibilities of minimising the effects?**
   - Technology
   - Alternative sites
   - Suitability of the area
   - Information on the ecological indicators
   - Information on biodiversity

3. **Unsustainable use of mangroves for Mariculture**
   Baseline information on the potential of mangroves

   - Where and how much of the resources?
   - Uses of the resources the presence and potential use
   - Existing traditional management practices
   - If they exist and their effectiveness
   - Ecological importance of mangroves
   - What is the production per unit area?
   - Productive per unit area

4. **Ecological impacts**
   - Biodiversity
   - Establishing of water circulation
   - Nutrients from the ponds
   - Characterisation of the potential of existing Aquaculture area
   - Assessment and monitor programmes
   - What levels of chemicals used to treat the ponds?

5. **What are the restoration/rehabilitation programmes?**
   - Extent of the area destroyed
   - Characterisation of the area
   - Ecological requirements
   - Possibility for natural generation enhancement
   - Resources requirements
   - How sustainable will be the project
   - Community participation

The same type of information is required for mariculture

Destructive resource uses

1. *To what extent are these fishing techniques being practised in Tanzania in terms of geographical scale and intensity?*
   - What techniques are destructive?
   - Source of the destructive techniques
   - Most affected areas in Tanzania
   - Trends in practising (number of sightings, catch data, people prosecuted, satellite image,)
   - Targeted or affected stocks

2. *What are the effects (pathological, ecological, sociological, economical) of using these techniques on the environment?*
   - Income harvesters gain from the exploitation
   - Rate of local consumption and amount exported
   - Economic and cultural values on exploitation of the resources
   - How many people have been affected (pathological impact)
   - Ecological impacts on biodiversity and indicators of impacts

3 *Are the people using it aware of the problems they are causing or no?*
   - Find out whether the users know the damage they are causing by the action and the extent.
   - Do they know the rate of decline?

4 *Remedial measures that can be done to rectify the problems*
   - What species can be used and how?
   - Environmental conditions necessary for restoration (factors)
   - Are there are any areas anywhere restored where techniques can be adopted

5 *Why fishermen use these techniques and for what?*

- Information on what they are using it for
- Information on what economic gains they get
- Information on existing alternatives

Strategy for data collection, synthesis and monitoring: Working Groups

Having identified specific data needs what program of data collection analysis and synthesis will be needed to address the issue.

Data requirement	Mode of collection	Resources		Gap
		Equipment	Manpower	
COASTAL EROSION				
Natural causes - Tectonic movement - Seismic data	- procure available seismic data - Install seismic station along the coast	4 stations	1 geophyist 1 geologist	Increase manpower
-Geomophology of coastline	- Collect the existing time series data - Annual aerial photography and satellite imagery.	-	1 geographer 1 geologist	
-Bathmetry	Collect existing bathmetric information Regular monitoring by echo-sounders and GIS Use seabeam for extensive bathmetric mapping	Maps and digital data Research vessel with seabeam and echo sounders	1 geographer 1 geologist 1 physical oceanographer	Increase power
Hydrodynamic causes waves, tides and currents	Current meters, tide gauges, sides scan sonner, wave raiders and off shore gauges. Sediment transport and numerical modelling	10 current meters, 10 tide gauges, 1 side scan sonner	5 physical oceanographers, 1 geologist and 1 coastal engineer	5 physical oceanographers
Time series information on coastal configuration and beach profiles	Satellite imagery , aerial photography and levelling	5 levelling equipment	Increase manpower	5 levelling equipment
Anthropogenic causes - sand mining and volume extracted	Field survey, interviews and record of existing information	Physical measurement and aerial photography	Available	none-

UNSUSTAINABLE USE OF MANGROVES			
ISSUES	Required data	Mode of Collection	Equipment and Manpower
A. Salt works	Location, area, and percentage of area covered	1.Interviews and questionnaires on the existing information 2. From maps, ground truthing, satellite imagery and topographic surveying	1. Sociologists surveyors 2. GPS, PCs, surveying equipment
	Suitability of the site	Environmental parameters especially salinity, Hydrological cycle, Rainfall patterns	1. Oceanographers 2. Salinometer, rain gauge, thermometer tide gauges
	Cultural value	Interviews and questionnaires on the existing information	Sociologists
	Alternative sites	Surveys on other salt production sites than in mangroves	Sociologists
B. Mariculture	Potential of mangroves	From maps ground truthing, satellite imagery and topographic surveying	1. Surveyors 2. GPS, PCs, surveying equipment
	Ecological impacts	1. Determination of nutrients and pH levels 2. Biological indicators	- Chemical Oceanographer - Taxonomists - Nitrates and phosphates analysis
	Rehabilitation/restoration/enhancement	Establishment of criteria necessary for replanting of mangrove seedling	- Botanists/foresters - Physical and Chemical analysis

DESTRUCTIVE FISHING TECHNIQUES

Issues	Data needs	Methodology	Personnel	Equipment
1.To what extent techniques practised geographical scale and intensity	Collect and collate (compilation) of existing information concerning the particular problem to identify the gaps.	Library search Visiting relevant institutions	Ecologists Social economists	Data management facilities (Transport Computer)
	Field observation for viewing the extent of the problem and scientific surveys to take inventory	Interviews field observations	Sociologists Economists Geographers Ecologists	Same as above
2.Awareness	Are the people using it aware of the problems they are causing or not Find out whether the users know the damage they are causing by the action and the extent. Do they know the rate of decline	Focused group meetings Participants observation Questionnaire and interviews Demonstration Drama and dances	Sociologists Economists Educators Communicators	Videos Tape recorders Pamphlets
3.Effects on environment	What species can be used and how Environmental conditions necessary for restoration (factors) Are there any areas anywhere restored where techniques can be adopted	Field assessment collects medical reports and interviews the people Browse the internet	Chemists Ecologists	Boats Transport Chemicals Diving gear
4. Remedial measure to combat use of destructive gears	What species can be used and how Environmental conditions necessary for restoration (factors) Are there are any areas anywhere restored where techniques can be adopted	Rehabilitation Experimental and demonstration plots	Ecologists local community	Transport Necessary equipment for the experiment

Issues	Data needs	Methodology	Personnel	Equipment
To what extent are these fishing techniques being practised in Tanzania in terms of geographical scale and intensity.	Collect and collate (compilation) of existing information concerning the particular problem to identify the gaps.	Library search Visiting relevant institutions	Ecologists Social economists	Data management facilities (Transport , Computer)
	Field observation for viewing the extent of the problem and scientific surveys to take inventory	Interviews Field observations	Sociologists Economists Geographers Ecologists	Same as above
Are the people using it aware of the problems they are causing or not	Find out whether the users know the damage they are causing by the action and the extent. Do they know the rate of decline	Focused group meetings Participants observation Questionnaire and interviews Demonstration Drama and dances	Sociologists Economists Educators Communicators	Videos Tape recorders Pamphlets
What are the effects (pathological, ecological, sociological, economical) of using these techniques on the environment	What income do harvesters gain from the exploitation Rate of local consumption and amount exported Economic and cultural values on exploitation of the resources How many people have been affected (pathological impact) Ecological impacts on biodiversity and indicators of impacts	Field assessment collects medical reports and interviews the people	Chemists Ecologists	Boats Chemicals Transport Field equipment for ecological work

ANNEXES

Annex I: **Workshop Program:**

THURSDAY 30TH JULY, 1998		
10.00 –10.15	Dr. J. Francis	♦ Welcoming note ♦ The role of IMS in Regional and national ICM programs
10.15 – 10.30	Dr. M. Ngoile	♦ Introducing meeting participants ♦ Overview on integration of science to ICM programs
10.30 – 11.00	Ms. E. Torell	♦ Introducing the ICM Policy cycle ♦ An overview of monitoring and assessment of marine and coastal governance – proposed program for Eastern Africa.
11.00 – 1130	Coffee and Tea	
11.30 – 12.30	Dr. J Garber	♦ Assessment and monitoring of coastal and marine ecosystems to inform ICM programs
12.30 – 14.00	Lunch	
14.00 – 14.20	Dr. J. Garber	♦ Discussion
14.20 – 14.40	Mr. J. Daffa	♦ Presentation of issues identified by TCMP Core Working Group
14.40 – 15.00	Mr. Daffa	♦ Discussion
15.00 – 15.20	Dr. M. Ngoile	♦ Formation of Working Groups
15.20 – 16.00		♦ Working Group Session
16.00 – 16.30	Coffee and Tea	
16.30 – 17.30		♦ Working Group Session and Presentation of results
17.30	Adjourn	

FRIDAY 31ST JULY 1998		
09.00 – 10.00	Dr. Garber	♦ Working Group Session
10.00 - 10.30	Coffee and Tea	
10.30 – 11.30	Dr. Garber	♦ Working Group Session and Presentation of results
11.30 – 12.30		♦ Working Group Session and Presentation of results
12.30 – 13.00	Dr. Ngoile Dr. Francis	♦ Conclusion ♦ Closing

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