Sida Evaluation 96/35

Sida/SARECs Marine Science Programs

Bilateral Programs in Tanzania and Mozambique and the Regional Program of East Africa

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TABLE OF CONTENTS

ABBREVIATIONS

CIDA	Canadian International Development Agency
CMC	Coastal Management Center
DAI-CD ROM	Development Assistance Information CD ROM
DANIDA	Danish International Development Agency
EAMFRO	East African Marine Fisheries Research Organization
EIA	Environmental Impact Assessment
FIPIS	Fishery Project Information System
FAO	Food and Agriculture Organization
ICLARM	International Center for Living Aquatic Resource Management
ICZM	Integrated Coastal Zone Management (= ICAM or CZM)
IDRC	International Development Research Center
IDRIS	International Development Research Information System
IMS	Institute of Marine Sciences
IOC	Intergovernmental Oceanographic Commission
IUCN	International Union for the Conservation of Nature
KMFRI	Kenyan Marine Fisheries Institute
LFA	Logical Framework Analysis
LME	Large Marine Ecosystem
MOU	Memorandum of Understanding
NARS	National Agricultural Research System
NEMC	National Environmental Management Council
NORAD	Norwegian Agency for Development Cooperation
ODA	Overseas Development Administration
SADCC	South Africa Coordination Countries
SAREC	Swedish Agency for Research Cooperation with Developing Countries
Sida	Swedish International Development Cooperation Agency
SIFR	Strategy for International Fisheries Research
TAFIRI	Tanzanian Fisheries Research Institute
UDSM	University of Dar es Salaam
UEM	University Eduardo Mondlane
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WIOMSA	The Western Indian Ocean Marine Science Association
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

Sida/SAREC's marine science programs in East Africa were established in the mid-1980s to address the increasing concerns about marine resource mismanagement. There was also a realization that the developing countries must enhance their knowledge of marine if they are to be able to manage their marine and coastal resources.

This evaluation covers three Sida/SAREC marine science programs in East Africa: the Bilateral Program with Mozambique that started in 1985, the Bilateral Program with Tanzania that started in 1990, and the East African component of the Regional Program, which was started in 1992. The evaluation was carried out during the period December 1995 - February 1996. The field visits to Tanzania and Mozambique, where the mission met with persons involved in the Programs, were conducted in December 1995.

It was not possible to carry out a traditional evaluation including an analysis of attainment of objectives, outputs and cost efficiency. Since strict guidelines for the formulation of objectives, activities, etc. - in accordance with the LFA format - were not in place at the time of the initiation of the Programs,. Despite this fact, it is the view of the mission that the relevance of the Programs is, generally speaking, high. However, it is recommended that the next phase of the Programs be prepared in accordance with the LFA-model of project cycle management.

During the evaluation it was noted that all **three Programs** have several features in common. Prior to the SAREC Programs there were very few scientists trained in marine environment issues, either to carry out research or to teach. This situation has changed. In Mozambique, and even more so in Tanzania, there is a core group of marine scientists, although a critical mass has not yet been established. Moreover, prior to the SAREC initiative there was little knowledge of the activities of neighboring researchers, and few exchanges of staff or other interaction. This has also changed, and there has been significant progress in scientific capacity-building in all three Programs.

All Programs face problems related to financial management and insufficient counterpart funds. Local financial and administrative routines and lack of trained administrative staff have hampered the release of allocated funds; but it cannot be said that the Programs are under-financed. The mission concludes that local financial management needs to be strengthened and decentralized, to give researchers greater control over their research projects and timely information about available resources. Coupled with the lack of counterpart funds and insufficient management capacity is the matter of absorptive capacity. In Mozambique, as well as in Tanzania, the absorptive capacity is limited, a fact that must be taken into account when the new phase is planned.

Another common issue is the pressing need to move from a single sector-based approach (e.g. fisheries, forestry, etc.) to a multisector and inter-disciplinary approach to planning and management of the coastal zone.

In both of the countries studied, marine science has suffered considerably from insufficient and sometimes a complete lack of trained manpower. The SAREC Programs have made a considerable contribution to closing these gaps. The number and levels of training achieved during the implementation of the Programs are significant accomplishments. It is the view of the mission that capacity-building has been and should continue to be the main priority for these programs. This is particularly true as most of the current trainees are in the middle

of their training programs, and it would be a serious waste of resources if the training programs were terminated. Although capacity-building as regards research is not complete, particularly in Mozambique, the main future concern should be how best to keep this group of researchers at the university and working on important national and regional coastal management problems.

There has been an encouraging move towards research in a variety of disciplines. This is particularly the case in Tanzania, where there has been a gradual increase in the number of M.Scs and Ph.Ds, and a promotion of linkages between studies of ecosystem components. However, the results cannot yet be regarded as an interdisciplinary approach to coastal development. Concerning the quality of research, the mission is of the opinion that greater emphasis needs to be placed on published results in international peer-reviewed journals.

In the future, efforts should be aimed at ensuring that resources are directed at the better use of this scientific capacity in the identification of and subsequent actions on critical development problems. This will involve mechanisms to expand the programs into associated levels of research on coastal resource management. There is also a greater need for applied research to respond to the needs of the users. The research agenda and research topic priorities should to a large extent be decided upon and driven by the needs of the stakeholders. Likewise, research results need to be translated into policy recommendations and ICZM plans.

The specific problems related to the **Mozambique bilateral program** concern research facilities at the Inhaca research station, serious financial management problems at UEM, routines for purchases of equipment, lack of suitable communication systems, donor coordination and counterpart funding (p.p. 19-20). The mission observed with satisfaction that the Mozambique program has obviously made a considerable positive impact on the country's research capacity as well as on enhancing awareness about marine and coastal issues. A base for a research capacity in marine science has been built, but the structure is very fragile and needs further support and development.

Specific problems related to the **Tanzania bilateral program** concern the urgent need for extension of the IMS facilities to allow the Program to function in the future; research priorities and dissemination of research results; interdisciplinary capacity-building, coordination of research activities between the departments of UDSM (Kunduchi research station and IMS) as well as between UDSM and other research organizations. The mission noted that the Program has contributed significantly to positioning the issues and research related to marine and coastal resource management in Tanzania. A research community has been established (although it is still small) and so have international contacts. The first phase of the Program has been successfully completed. The Program is now entering a new phase in which some remaining unsolved issues have to be tackled - basically related to research management - but new challenges lie ahead. These include the need for a broader interdisciplinary approach to the problems, and the need to establish mechanisms for the dissemination of research results and their translation into policy actions that affect institutions, planning and the legal framework, as well as resource allocation to integrated coastal zone management.

To summarize the current situation with respect to the two bilateral programs evaluated here: in Mozambique there are basically adequate facilities but a lack of researchers, while in Tanzania there are researchers but a lack of facilities.

The **regional program** has played an important role in addressing issues and handling matters that could not be dealt with within the framework of the bilateral programs. It has added flexibility to the Programs and provided essential training and enhanced awareness. In the new phase of the marine science programs it is proposed that the role of the regional program should be properly discussed and analyzed. Such an analysis would also include the management system for the Program. The positive and negative aspects of the regional program are summarized on page 39.

The mission observed that the collaboration between all the parties concerned functions well. However, closer collaboration and cooperation between the Swedish institutions involved would be an advantage, so as to allow results, experiences and problem-solving to be shared. There seems to be a slight competitive tendency among the Swedish institutions.

During the initial phase of establishment of the programs there was a great need for flexibility both in approaches as well as implementation, i.a. to adapt objectives and activities to reality. The Programs were carried forward by teams of dedicated staff at the various organizations involved, including the funding institution. This flexibility and management of the Programs was appropriate for the type of problems encountered and tasks to be fulfilled at the initiation phase of the Programs. However, a new phase will address different issues and require other modes of operation. Therefore, it is necessary not only to review the contents and operation of the new programs, but there is perhaps an even greater need to review the structure of coordination and management, taking into consideration twinning arrangements. There is also a need to prepare interdisciplinary research and training activities in coastal zone management. Further, the review should include research management at the receiving institutions in East Africa, the counterpart institutions in Sweden, the role of the reference group, the role of the Swedish coordinating body and the monitoring and evaluation system. In short, a new framework for program management.

Looking at the future of the programs, the mission noted that there is a great need of active donor coordination. One way of establishing coordination and an interdisciplinary approach is to create a "network of networks" with an institutional base which will be jointly donor-financed. A proposed long-term extension of e.g. WIOMSA to play such a coordinating role is outlined in the report (pp. 50-53)

In conclusion, it is the view of the mission that the Programs have made a significant contribution to capacity-building and awareness-creation in marine science and marine and coastal resource management. Tangible and important achievements have been made. The management of the Programs can also serve as a model of how to initiate new high-risk programs, where great flexibility is necessary. The Programs have now completed their first initiating and establishment phase and arrived at a more mature stage. This new phase requires different approaches to collaboration, management and the establishment of research priorities. To set the new phase in motion, a set of recommendations for Sida and the two governments concerned are given at the end of the report (pp. 55-56).

1. INTRODUCTION

1.1 Background

The marine and coastal environment is increasingly being recognized as an important resource system. Most of the world's major cities are located in the coastal area, and the largest share (60%) of the world's population live within this zone; a share which is predicted to increase to over 75% of the world's population by the year 2020 (Figure 1). Globally misuse of coastal resources is widespread. If allowed to continue unabated, resource mismanagement of coastal areas will most likely lead to depletion, pollution and eventual destruction of this critical ecosystem. Sustainable development of coastal zones should maximize the benefits to society, while minimizing the environmental costs both now as well as for future generations.

The SAREC marine science programs in East Africa were established in the mid 1980s to address this issue. The initiation was timely, since awareness and concerns on marine and coastal environmental issues were starting to grow. Similarly, there was a growing realization of the potential contribution of research to sustainable development. Research, particularly that done in situ, is recognized as a provider of valuable knowledge and understanding to be used for improved management.

The SAREC support to East African marine science has now been ongoing for almost ten years and some tangible results have been achieved. It is therefore opportune to evaluate the past performance, achievements and shortcomings and from that evaluation discuss what should be the priorities and mode of cooperation for the next phase. To date there has not been any evaluation of these programs.

This evaluation encompasses three marine research programs: the Bilateral Program with Mozambique, the Bilateral Program with Tanzania and the Regional Marine Research Program. The latter includes three regions: East Africa, the Caribbean and South-East Asia. Only the first component is included in this evaluation. This part comprises 80% of the budget of the Regional Program. The terms of reference of the evaluation are appended in Appendix 1.

The evaluation is based on documentation of the Marine Programs, scientific reports produced by the programs, and extensive discussions with persons concerned (Appendix 2). These latter discussions were conducted in a semi-structured manner where the team attempted to establish: (1) the achievements so far concerning capacity-building, research management, research support, administrative capacity, future plans and priorities; (2) the role of SAREC in this process; (3) the relation to other donor activities - directly or indirectly; (4) the linkages of the programs with other scientific/research activities, policy initiatives, and private sector activities; (5) the government support for the programs and how that has changed over time; and (6) the short, medium and long term goals of the evaluated programs.

Figure 1: Population distribution, 1960, 1991 and 2020.

Sida/SAREC commissioned SPM Consultants to make the evaluation of the Marine Science Programs with a focus on East Africa. The evaluation team consisted of: Dr. Jan Rudengren, SPM Consultants, Stockholm (team leader), Professor Per Brinck, Department of Ecology, University of Lund, and Dr. Brian Davy, SIFR/IDRC, Canada. Ms Camilla Hedlund, SPM Consultants, provided administrative support to the team. The evaluation was carried out during December 1995 - January 1996. A draft report was circulated for comments in March 1996.

At the outset of the evaluation, the team met in Zanzibar with the reference group to SAREC's Regional Marine Science Program. During the first week in December, discussions were held in Tanzania and Zanzibar with concerned people of the Tanzanian Bilateral Program and the Regional Program (Appendix 2). The team visited the Institute of Marine Science in Zanzibar and the University of Dar es Salaam (UDSM). There were also possibilities to visit research projects in Zanzibar. During the second week of December the team visited the University Eduardo Mondlane (UEM) in Maputo and the Inhaca Marine Research Station, where discussions were held with concerned staff (Appendix 2).

1.2 Structure of the report

The report starts in Section 2 with an overview of common features and findings of the three marine science programs evaluated. The three following (Sections 3-5) are an account of the individual programs build along a similar format: history and main events, objectives, structure and organization, finance, mode of intervention, findings and analysis of progress, which comprises achievements, gender issues, effectiveness, relevance and impacts. Each of the three Sections closes with a discussion of the problems encountered and conclusions. The core of the evaluation is brought to an end in Section 6 by an analysis of the structure of collaboration within the programs, which includes an analysis of the relations between the Swedish institutions and the local institutions, and between SAREC and the participating countries, and finally between the Programs and the regional and international organizations. Section 7 gives an account of other donor activities in the field of marine sciences in the area.

Drawing from the findings and analysis of the current programs, Section 8 looks ahead and sets the framework for the next phase of the programs. The evaluation is concluded by a summary of the findings and provides recommendations and short term-actions to be taken by Sida/SAREC and the respective governments to pave the way for future cooperation in the field of marine science and coastal zone management.

2. THE SIDA /SAREC MARINE PROGRAMS

2.1 Overall Program Objectives

Based on discussions with SAREC program staff and the national scientists and planners, the long term objectives of the programs have been summarized as follows:

- To build a sustainable marine science institutional capacity in Tanzania, Mozambique and the East African region.
- To establish a process of local, national and regional research priority setting, based on the needs for a sustainable marine ecosystem for East Africa. This priority setting system would provide the scientific direction for the research and would involve most key stake-holders, e.g. coastal communities through to planners/policy makers related to coastal zone management[1].

2.2 Common Financial Issues

The Mission believes that the various programs have been adequately financed to date. In fact, in the case of the Mozambican program, it was explicitly stated that the Program did not suffer from a lack of funds. Although the international financial support was felt to be sufficient, there has been a lack of national (counterpart) funds for staff, maintenance, office and research expenses, which has hampered the development of the programs. However, despite the meager financial resources of the Mozambican and Tanzanian governments, there have been positive signs. For instance in case of the Tanzanian Program, the Government increased its funding in real terms to the Institute of Marine Science (IMS) in parallel with the initiation of the SAREC program (see page 27).

The insufficient counterpart financing and institutional capacity often infer that the absorptive capacity for international assistance is limited. This fact has at least two implications for assistance to programs such as those evaluated. In a medium-term perspective, increasing Swedish funds could lead to a situation where a large institution has been created requiring substantial recurrent funds. If such funds cannot be allocated by the Government, the created institution and capacity will collapse once international assistance is withdrawn, with a loss of human and capital resources. Consequently, when assistance is contemplated a long-term engagement must be considered. In a short-term perspective, there is a risk that considerable additional financial resources would not be beneficial, as the efficient use of the funds is likely to be reduced. There could emerge a situation of over-saturation, where the marginal utility of additional funds is diminishing and may even become negative. Thus, a balance must be struck between absorptive capacity and transfer of funds.

A major constraint to the efficient administration and implementation of the programs, as observed by the Mission, is the limited capacity concerning financial administration and management. This was most obviously manifested in the long time required for release of Swedish funds from the universities in Mozambique and Tanzania, and the lack of correct and up-dated information on the financial status of the various research projects within the program. This observation is particularly true for the Mozambican program. The

[1] In this report, coastal zone management, abbreviated as CZM, is assumed to be synonymous with ICAM (Integrated Coastal Area Management) and ICZM (Integrated Coastal Zone Management).

accounting section does not have sufficient capacity and proper routines for efficient financial management. Since the financial management is very centralized and lacks sufficient resources, it constitutes a major bottleneck in research administration and implementation. Therefore, there is a need for a decentralization of the accounting and financial management at the UEM in Mozambique.

In the long run there is also a need for securing sufficient local financial resources, to reach a sustainable level of the research activities. There is a need to optimize the use of scarce financial and personnel resources both nationally as well as regionally. This will assist the institutions to become more independent of international assistance (i.e. become sustainable).

2.3 Regional Networking

Networking is important, not the least in the developing world where resources are scarce. The Western Indian Ocean Marine Science Association (WIOMSA) has been an advantageous instrument for regional activities. It was inaugurated in 1991 as a non-governmental and non-profit organization dedicated to: *"promoting the educational, scientific and technological development of all aspects of marine sciences"*. The Association *"gathers and disseminates marine science information"*, *"holds all types of meetings to foster marine science development and information exchange and enhances better communication among marine scientists and other professionals"*. It has been supported financially by SAREC, and lately by the SAREC supported IOC program for the North and Central Western Indian Ocean. It is governed by a board of officers elected every three years at a General Meeting. Its headquarters and secretariat are located at IMS, Zanzibar, and thus provide direct access for the programs to the rest of the region and other international bodies.

Membership can be either institutional or individual and funds are derived mainly from membership fees and donors. A main reason for starting the regional program was to address the lack of cooperation and communication in marine sciences between East African countries. This issue continues to be a concern even today.

At present WIOMSA, although still at an initial stage of development, is active broadly as a forum for discussion and dissemination of information, a place of meeting for scientists and influential people in the region, and a mechanism for networking for the promotion of sustainable development in the marine environment. As a structure for inter-institutional linkages, the organization has the potential to play an expanded role in the development of various training and cooperative research approaches in the region.

One exciting initiative under WIOMSA is the marine research small grants program (approximately USD 10,000 in total). Six small grants have been awarded to date for activities such as: field research in the home country, travel for research training or collaboration for up to three months in another laboratory, and for attendance at conferences or workshops to present research results. This program provides important benefits to research itself, capacity-building and dissemination. Information and communication has been developed in close collaboration with RECOSCIX, through the WIOMSA newsletter *WINDOW*.

2.4 Reference Group

A Reference Group, connected to the Regional Marine Science Program was established in 1993. Its members are:

Magnus Ngoile, Head, Marine and Coastal Management, IUCN
Chua Thia Eng, Director, CMC
Per Wramner, Director General, National Board of Fisheries
Gunnar Kullenberg, Executive Secretary of IOC
Carl Gösta Widstrand, Professor Emeritus, University of Linköping
Head of Programs, Sida/SAREC

Its function is to provide scientific and technical advice to the SAREC Regional Marine Science Program. Since its inception, it has met three times.

This group has provided useful guidance in terms of planning the different possible orientations of the marine science program. In addition, the group has assisted in making the critical linkages at the policy level, and internationally with leading individuals and programs. The group should be continued but in a more formal manner, particularly as an overall advisory body to the regional and evolving inter-regional network. The proposed increased formality should include a feedback mechanism on the follow-up to advice given by the Reference Group. Particularly as expanded linkages, through multi-donor funding, are recommended for the next phase, the Reference Group can provide valuable guidance as well as an important quality control mechanism to this network. An overall stewardship mechanism would give more credibility to the network and assure most donor agencies that there was in place a technical supervisory mechanism. It should be noted, that the reference group is not recommended to be a large and formalized bureaucracy, but rather a small "think tank" group .

2.5 Awareness Building

2.5.1 Public initiatives

Without public knowledge of plants, animals and the connections between the natural systems there is hardly any awareness of the threat that heavy exploitation and destruction of the natural resources might imply. Popular information about the flora and fauna of the coastal environment in East Africa is scanty. An interesting start has been made on this topic through the funding via the Regional Program of a field guide to the seashores of East Africa. The handbook *"The Fauna and Flora of the Seashores of East Africa"* will describe, with illustrations, more than 1000 species of plants and animals including information about their habitats and life history. The drafted text is edited by Mr. Matt Richmond based at IMS. The book is planned to be published in 1996 as a SAREC publication, and a promising sample of text and illustrations was made available to the Mission.

In both Tanzania and Mozambique, informative video and other teaching aids were produced to be used in local schools as part of the awareness building. Activities supported by the Bilateral Programs provide the information and logistic base for these productions[2].

As explained in Section 8, new technology could be tried here. For example, the initial production of marine biological video programs in Tanzania and Mozambique should be expanded and multimedia techniques introduced, using CD ROM. Other awareness building initiatives such as participation in Oceans Day should be considered.

[2] There is a video studio at IMS funded by CIDA.

2.5.2 Policy initiatives

Important efforts have been made to date to push the marine science agenda with policy makers through efforts such as the conference in Arusha[3], Tanzania. The Arusha meeting has laid an important base for this type of linkage and a second conference is planned for the Seychelles in 1996. A national workshop on ICZM was organized in Zanzibar in April 1995, with participation of researchers and politicians. One of the results of the workshop was a "High Level Statement" of all the participating ministers and permanent secretaries.

It is recommended that funding for further such meetings be programmed to include all interested countries in the region. It is the opinion of the Mission, that this approach will provide important benefits in terms of future allocation of resources, as well as translating research results into meaningful policies and regulations to provide for sustainable development of marine and coastal resources.

2.6 Achievements

Three factors determine the research results: the physical resources, the human resources and the ambiance. They form a complex system where the three determinants have a relative weight, differing between the various fields of research. They depend on each other and may interfere, particularly when the weight of one (or two) of them falls below what is needed for a positive result. At levels of high performance the three factors score high, while low performance of a scientific team may have many explanations, as is evident from the following exposition.

In general, there has been significant progress, compared to "pre-SAREC", in scientific capacity-building in all three programs; this has been a major achievement and all involved should be congratulated for the efforts to date. In the future, more resources should be directed to the better use of this scientific capacity in the identification and subsequent actions on critical development problems. This will involve mechanisms to expand the programs into associated levels of research on the coastal development paradigm. For instance, greater involvement of stakeholders such as the coastal zone users needs to be developed particularly in the identification of the research agenda. Likewise, research results need to be translated into policy recommendations through linkages with managers and other government officials.

For an account of achievements specially related to an individual program please refer to Sections 3.6, 4.6 and 5.6

2.6.1 Scientific results

In general, scientific results have been limited, compared with expected results form developed institutions, and are mainly descriptive of the status of the resources. Published results are listed in Sections 3.6.1.1 and 4.6.1.1.

Disciplinarity: To date there has been an encouraging move towards research in a variety of disciplines with results in zoology, botany, ecology, socio-economics, geology, and oceanography. However, more remains to be done here to achieve the necessary interdis-

[3] Proceedings of the Workshop and Policy Conference on Integrated Coastal Zone Management in Eastern Africa including the Island States.

ciplinarity for sustainable development in the coastal zone. In addition, there have not been enough linkages between these disciplines; most important development in the coastal zone requires approaches that link the disciplines and emphasize studies at the interface of these disciplines.

Quality: Greater emphasis needs to be placed on scientific results published in international peer-reviewed journals. The incentive system for researchers needs to be restructured as part of this objective (cf. Sections 2.7 and 8.2). The science quality needs further upgrading[4]. Similarly, a move needs to be encouraged, away from descriptive resource assessment research towards analytical problem solving/modeling approaches.

Direction: To tackle the current shortfalls in research that is directly geared towards resource management issues, there is a requirement for more applied research. The research agenda, the process and topics should to a larger degree be decided upon and driven by the needs of the stakeholders of the coastal and marine resources. As a consequence of such an approach, a research priority setting system would ensure that the stakeholders have a real possibility to provide input into the definition of research needs. The research results would in their turn be easier to translate into policies and management actions, as they are based on perception of problems and priorities of the users of the resources.

2.6.2 Training

Training is an important ingredient among the efforts necessary to bring students to the desired proficiency for scientific work. In the natural sciences, the training grounds are often complex and may be difficult to penetrate both technically and intellectually. Besides scarcity of funds there are several potentially major limitations: the number of available students, the lack of facilities, library and equipment (particularly instruments), logistic constraints, and limitations of technical and supervisory expertise. Almost all of the above mentioned hindrances existed during the course of Sida/SAREC support of the marine sciences in East Africa.

Both in Mozambique and Tanzania, marine science has been suffering considerably from lack of trained manpower. There was a serious shortage of trained scientists and teachers when SAREC initiated its support. The assistance involved stimulating staff members of the university biology departments to undertake higher degree studies (M.Sc. and Ph.D. degrees) supplemented with various short courses.

The numbers and levels of training achieved to date are an important accomplishment. Capacity-building has been and should continue to be the main priority for this program, particularly as there are many trainees still in the middle of their programs. Most training seems to be proceeding well; most degree training has been of the "sandwich program" style, where the student spends most time in his/her own country and works on a local research problem. Sida/SAREC's insistence on keeping the trainees in their home environment for as much of the training as possible is paying off in at least two ways: (l) in terms of not losing trainees who otherwise might not return home, and (2) in decreased adaptation

[4] It is recognized that present quality is a natural consequence of the present initial stage of human resource development; see the training discussion below.

problems to new environments for trainees both at the new training location and more importantly on their return home.

To date there have not been any losses of trainees, all have returned to work in the project or are still in the midst of their training program. However, there are trade-offs to the sandwich program approach. Trainees complained that parts of their research program were delayed due to difficulties in being able to meet their supervisors on a regular basis. This was partially solved through the use of e-mail and fax, but these forms of communication could not fully compensate for face to face discussions between the student and supervisor. With the return of more trained manpower to act as supervisors, this problem will be at least partially solved.

Most early degree trainees had permanent positions at the university to return to; this might not be possible in the future. Increased effort needs to be made on research incentive measures to keep these staff in positions that they have been trained for, e.g. opportunities to join marine science courses as teachers and research projects supported via WIOMSA (cf. Sections 2.3 and 8.5). These incentives should be coupled with a more detailed institutional staff development plan at least in terms of future needs in the marine sector. The Mission did not see any evidence that there had been any detailed planning of training needs to date.

2.7 Inter-Program Problems

One issue common to all three programs is the pressing need to move from a single sector based approach (e.g. fisheries, forestry, etc.) to a multisector and interdisciplinary approach to planning and management of the coastal zone. Related to this is a need to move from a strong pure research approach to applied research and ensure that research results are disseminated and translated into policy actions and management plans.

Another common problem to all programs is the likely loss of significant numbers of trained staff. To date Sida/SAREC has made a significant investment in building a local research capacity. Although this effort is not complete, particularly in Mozambique, the main future concern should focus on how best to keep this group of researchers in the university and working on important national and regional coastal management problems. Sida/SAREC and the national research system have made a significant investment in building a capacity to do high quality marine research. The money invested to date amounts to about SEK 600,000 per Ph.D. and SEK 350,000 per M.Sc. plus costs for various short courses.

2.8 Effectiveness, Relevance and Impact

It is generally difficult to give a judgment of the effectiveness[5] of the programs. This stems from several circumstances: the objectives are not explicitly stated in the program documents and have consequently been inferred by the evaluation team; the objectives are in most cases formulated as activities, thus they are impossible to measure. This critique of the limitations of the stated objectives - which makes an analysis difficult - is done in retrospect. At the time of the formulation of the programs and in their planning phase, the demand for an elaborate analysis of problems and objectives was not really there. It is only recently that these requirements for clearly defined objectives, output, activities, etc. have been stated and institutionalized. The program administration should therefore not be criti-

[5] The degree to which the objectives have been reached.

cized for not living up to current requirements in respect of a logical structure of problems, objectives, output, activities and input. However, the next phase of the program needs to be planned in such a manner that a proper program management systems is established.

Bearing the above factors in mind, the Mission can, however, provide a qualitative judgment of effectiveness, relevance and impact. As regards the first part of the objectives (institutional capacity-building) the assessment is positive. Given the very difficult situation at the start, particularly in Mozambique, and the relatively short time since the beginning of the activities in 1990 (in Tanzania) and 1992 (East African Regional Program) progress has been substantial. The building of a sustainable research capacity has started, but the main ingredient related to this capacity is still missing, namely sufficient domestic financial resources to complement and eventually totally replace international financial assistance.

In general, the relevance[6] of the programs is high. All three programs are addressing the core problems and are producing the results needed to reach the expected impact. The outputs are also contributing to the solutions of the problems and form a logical part of the strategy of the programs. The focus on institution building is correct and appropriate. The programs now need to expand the ecological framework and open linkages to management disciplines, as suggested in the objectives, and in the following Section 8. There are important differences, however, between the programs, which will be further elaborated when the individual programs are analyzed.

A long-term impact on capacity-building in the selected research institutions is clear, provided that sufficient future financial resources are secured. There are few examples only of long-term impact on and development effects of coastal zone management, particularly major impacts at the community level in the coastal zone. One such indirect effect of the programs is the sea-weed farming in Zanzibar.

[6] Relevance of a program/project refers to the program's ability to address the problems: is the program doing the right things?

3. MOZAMBIQUE BILATERAL PROGRAM

3.1 History

Prior to the SAREC support to marine environment research, there were very few trained scientists either to carry out research or for teaching. In 1975, a group of four Mozambican fishery biologists founded the Fisheries Research Institute in Mozambique. When the Faculty of Biology at the University of Eduardo Mondlane (UEM) was closed in 1980, three of its scientists were placed at the Fisheries Institute. At the time of the closure, there were no marine biologists who had a Ph.D. degree at the university, and the university facilities were in a bad state due to under-funding. However, the Marine Biological Research Station in Inhaca Island, which had been established in 1951, was kept with its library and museum and was maintained by the university until the Faculty of Biology was re-opened in 1985. Both the Department of Biology at the university and the Inhaca Research Station had a tradition in marine science, but were dormant at the time of the initiation of the Sida/SAREC support.

As part of the general Swedish support of Mozambique a marine project was started in 1985. The same year the UEM opened, and biology students were accepted for the first time since independence in 1975. In close cooperation with the Faculty of Biological Sciences of the UEM, scientific and technical staff from the Kristineberg Marine Biological Station in Fiskebäckskil refurbished the Inhaca Marine Biological Station so that it could be used for education and research. During the first few years, however, training of Mozambican students had to be done at Kristineberg in Sweden, until infrastructure and equipment allowed for field courses activities in Inhaca.

When the Program was introduced, there were no Mozambican who held a higher degree within marine sciences. However, the first Mozambican students were ready to start studying towards a M.Sc. within the SAREC project. These studies were organized in collaboration with the Departments of Marine Botany and Zoology at the University of Göteborg. At the same time, an agreement between the UEM, SAREC and the Royal Swedish Academy of Sciences and its Marine Biological Station at Fiskebäckskil made it possible for these students to become the first Mozambican professionals at the Biology Department of the UEM.

Dr. Lars Hernroth at the Kristineberg Marine Biological Station has been the overall coordinator of the program. Since 1993, funds have been administered by SWEDMAR, Göteborg (funds to be used in Sweden) and the central administration of the UEM, Maputo (funds to be used in Mozambique). The Inhaca station has established routines for ordering and purchasing goods and equipment, mainly through the Swedish institutions.

Similarly, the Fisheries Research Institute could resume its activities in the application of marine resources, almost 100 % funded by NORAD, and including the small departments of Oceanography and Aquaculture.

3.1.1 Main events

During the first phase of the Program, much work was concentrated on rehabilitation of the Inhaca Research Station in order to establish a research platform. Priority was also given to training in basic biology and research methodology. In 1988, there was a clear structure of

a new phase of the program, more students had enrolled at the Department of Biology and there were field courses in Inhaca. New elements in training were initiated for technical staff on maintenance and development of the research station; this was done in close collaboration with technical staff from Kristineberg Marine Biological Station. During this stage the initial group of students started to prepare their Licenciatura[7] research project.

By 1990/91, there were fourteen students left of the initial 30, who were about to graduate and receive their Licenciatura. Efforts were made to make the students to stay with the university, studying for a M.Sc. An agreement was made between Sida/SAREC, Kristineberg and UEM, and five students became the first professional Mozambican nucleus of the Department of Biological Sciences. The M.Sc. students actually started their programs in 1991/92, when the peace process and political turbulence created a situation of great administrative problems and financial constraints from the Mozambican side. During the early 1990s, the students started to participate in international conferences and met with regional scientists, mainly through the Sida/SAREC Regional Program. The students also started to advise the government on matters related to marine and coastal resources, and became partly responsible for the teaching and administration of various sectors of the department. In 1994/95 two students completed their M.Sc. and three more will hopefully be ready in 1996.

At this time, other donors also started to take an active part in the capacity-building at the university. In case of the Inhaca Station and the Department of Biological Sciences donor agencies in Canada, the Netherlands and Norway supplied assistance.

3.2 Objectives

The overall objective of the Mozambique bilateral program, as deduced[8] by the evaluation team, is to build and strengthen the research and training capacity of the Department of Biological Sciences, and to rehabilitate the Biological Marine Research Station at Inhaca Island. It has been hard to analyze in more detail the objectives, outputs and activities. This is especially the case for the early years of cooperation. However, in the application to SAREC 1993-94 two objectives are specified:

1. To develop and strengthen the training of Mozambican staff to academic level that will result in trained personnel able to carry out their research, as well as their supervisory and teaching duties within the Faculty of Biology.
2. Concomitant with (1) above to provide the necessary infrastructure support to enable advanced research to be carried out within the Faculty of Biology and the Inhaca Island.

These two objectives fairly well covers the deducted overall objective of the program.

3.3 Structure, Organization and Mode of Cooperation

The basis of the Mozambique Bilateral Program is a close cooperation between the Department of Biological Sciences, UEM and Kristineberg. The Sida/SAREC program introduced a new model of research support in Mozambique: the students stayed on their

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[7] A Licenciatura degree, taking five years, is approximately equivalent to a B.Sc.

[8] This deduction is based on discussions with concerned staff, since few objectives have been stated in the documents.

home ground and had a minimum of activities in Sweden - "the sandwich model". The students should also played an active part in rebuilding the university. One effect of the Sida/ SAREC model is that an academic degree would take a little longer, but on the other hand the students are working in their own environment with local topics and are actively strengthening the faculty.

Table 1: Organization and staff of the Biology Department of the University of Eduardo Mondlane.

Botany Section	3 academic staff	1 Ph.D., 1 M.Sc, 1 Lic.
Ecology Section	7 academic staff	1 Ph.D., 2 M.Sc, 4 Lic.
Zoology Section	11 academic staff	1 Ph.D., 1 M.Sc, 9 Lic.
Marine Biology Section (Inhaca Research Station)	1 Marine Biologist, others - technical staff	1 Lic.

In total, the Department has 22 academic staff (lecturers or docentia) out of whom eight are female. There are three Ph.Ds (1 Mozambican), four M.Sc. (2 Mozambican), and 17 Licentiatura. In addition there is 80 non-academic staff, of which 21 are located at the research station in Inhaca. Among the academic staff there are seven Sida/SAREC students. All are at the Masters level and two are starting to plan their Ph.D., and one has soon completed his Ph.D. There are 97 students in the department - 39 male.

This is much a department in transition in terms of meeting its objectives for teaching and research. The academic staff is limited, but much progress has been made in recent years. All staff seem to be very committed and the Sida/SAREC master students are ambitiously tackling local problems in marine science as part of their further training.

The system of approval of proposals for donor funding is as follows. Proposals are passed to the Faculty of Science and then the Scientific Directorate, the Science Council and finally to the Rector for approval and dispatch to the donor agency.

3.4 Finance

The bilateral Mozambique Program started on a regular basis in 1987. Prior to this (1985-87) only small activities were supported, such as meetings and facilitation. The first triennial program (1987-89) was the first traditional SAREC capacity-building program in case of marine sciences in Mozambique, and the first group of students was identified. The first triennial program had an annual allocation of some USD 140,000. The second triennial period (1989-92) saw an expansion as funds became available for laboratory equipment and rehabilitation of the Inhaca research station. Annual allocation was around USD 200,000. In the third three-year period allocations were further expanded to approximately USD 250,000 per year. This is about 25% of the Tanzania bilateral program budget. The budget for the 18 months fiscal year 1995/1996 is SEK 2.1 million, approximately equivalent to USD 300,000 (Table 2). Less than 20% of the budget allocation is directed to the Swedish cooperating institution.

Table 2: Mozambique Bilateral Program. The current allocation 1995-1997 (18 months), in SEK '000.

Budget item	UEM	UEM grants administered by cooperating Swedish institutions	Cooperating institutions	Total
1995/96 (6 months)				
Equipment & consumable	437	507	75	1019
Travel	450	80	150	665
Subsistence grants	250			250
Salaries		68	400	206
Others (overhead, allowances, etc.)	134	34	65	
Total	1271	689	690	2650
1997				
Equipment & consumable	278	527	75	880
Travel	450	65	150	665
Subsistence grants	250			250
Salaries		56	150	206
Others (overhead, allowances, etc.)	98	10	31	139
Total	1076	658	406	2140

Source: SAREC. Spreadsheet: BUDMALL.XLS 1995-05-23.

3.5 Mode and Type of Intervention

The Mozambique bilateral program comprised financial support, personnel in the form of scientific supervisors, and management of the establishment of functioning research institutions. This was the formal mode of interventions. However, in reality the personnel assistance and support from Swedish research institutions became more diversified. It even included provision of advance payments on equipment that should have been paid by the UEM.

When Sweden initiated the support to Mozambique in marine science it was a risky undertaking. Politically the country was very unstable and hardly any domestic financial resources were available for counterpart funds. Therefore, the Swedish assistance had to tackle the most basic issues. The Mozambican institutions needed close assistance from the Swedish counterparts. A personal dedication grew not only from the local staff but also from the Swedish side. This dedication has carried the program through the difficult times.

Formally, the responsibility rests with the Mozambican institutions, but in reality the Swedish counterpart took a very active part - especially in overcoming the complicated financial routines, to ensure that the ordered equipment arrived in Mozambique.

3.6 *Findings and Analysis of Progress*

3.6.1 Achievement

Institutional development has been much slower in Mozambique than initially planned. However, significant progress in staff development has been made and most of the delays were due to the difficult economic and political situation in the country during the years of guerrilla warfare. More training is still required and more staff need training to the Ph.D. level before major interdisciplinary research programs in marine science can be undertaken by national staff.

Some research is underway. It is mostly descriptive but still useful in connection with identification of problems that need to be examined in a more analytical fashion.

3.6.1.1 Scientific results

Over a long time the build-up of the Inhaca Marine Biological Station was hampered by great difficulties (cf. Section 3.1). The situation has eased the last few years. Hopefully, facilities, equipment, and logistics will have reached an acceptable standard in 1997. Still bureaucracy slows down scientific activity and extends individual studies unreasonably. Therefore, this chapter deals less with scientific results than with the efforts committed so far to create an intellectual and infrastructural basis for the scientific work, e.g. development of fields of work and selection of degree topics.

The topics chosen for the M.Sc. degree cover a broad range: 1. Botany (sea-grass communities and ethnobotany), 2. Marine zoology (populations of Hermit Crabs, recruitment of the crab *Scylla serrata*, and mammal conservation), 3. Limnology (phytoplankton), and 4. Soil ecology (slash and burn agriculture).

So far, two students have completed their M.Sc. and three more are near completion. Some of them may continue towards a Ph.D. One Swedish student (Matz Berggren) has presented his Ph.D. thesis, based partly on studies at the Inhaca Station: Habitat Choice of Benthic Shrimps (1994). Due to the general lack of formally competent and experienced (marine) scientists, the two Masters (and to some extent also the Masters to be) fill important positions as teachers and administrators (e.g. department and division directors) at the UEM, which interferes with their own scientific work.

For a long time the limited resources and number of graduated students restricted the number and nature of the topics worked on. A change is in a fair way, but the amount of publications so far produced in connection with the Inhaca Station and the SAREC marine program is small:

1. Two (mimeographed) M.Sc. theses; substantial and good pieces of craftsmanship.
2. Dr. Berggren's three systematic papers on shrimps in (mainly) Mozambican waters; good contributions to our knowledge of the Crustacea in the region.
3. One paper by S.O. Bandeira in Ambio (1995) on sea grass and seaweed beds in the region; well-arranged and informative.
4. Two well-written, programmatic synopses on the resources of Inhaca Island and its Marine Biological Station by L. Hernroth & D.Z. Gove resp. A. Macia & L. Hernroth (Ambio 1995).

5. Two conference reports by D.Z. Gove (1993,1995).

With due deference to the great achievements at the restoration of the Inhaca station the scientific output so far has been small.

It may be questioned whether the Mozambique Program, the Inhaca project, ever has reached a critical mass, sufficient for both development of the field station, training the students, coping with the "serious shortage of everything" and the numerous logistic, administrative and security problems? During many years the coordinator had to carry a heavy burden, struggling to build a research and training capacity in Inhaca. It has been slow going, but in view of the limited resources and great problems it has been successful.

In the near future it would, however, be desirable to re-direct the research objectives towards a more coherent program for sustainable management of coastal marine resources. It is expected that future marine research will involve community based management, including participatory methods and similar approaches. The output should be stimulated by enhancing international research cooperation, allowing increased interaction between participating scientists, and - as for the training of local students - by advancing teamwork and by larger input of scientific supervision.

3.6.1.2 Training

In Mozambique training had to start with first year biology students (cf. Section 3.1.1). Training them in research in Inhaca Island was not realistic, so particular training courses were given for a limited number of students at Kristineberg in 1987-1990. At the same time a Swedish Ph.D. student started his research program on shrimps of Inhaca waters.

By 1991, 14 students were about to graduate and get their Licenciatura. Five of these graduates choose to proceed towards a M. Sc. within the Program according to a plan containing literature review courses, participation in workshops and conferences and research for the thesis - the major part. Special courses, e.g. in diving, were attended in Sweden, Kenya, Zanzibar and Seychelles. In 1994/95, two had completed their M.Sc. and the three remaining theses are due in 1996. For the three first-mentioned students, plans for a Ph.D. are being discussed and Sida/SAREC has agreed to support them for another contract period (Table 4).

The relatively large number of trainees still in the middle of their training emphasizes the need for continuation of the support for this program. Most training seems to be proceeding well. However, in case of Ph.D. students it seems conceivable that their studies will be delayed due to the positions that the candidates hold as teachers, supervisors and administrators at the department. Mr. Gove is Resident Biologist and Head of the Inhaca station. Mr. Macia is Head of the Department of Biological Sciences. Moreover, the university and ministries often call upon the Ph.D. students for information and to represent Mozambique abroad.

When the first two M.Sc. students had graduated, two new students were accepted in marine biology. Both have chosen programs (marine mammals and ethnobotany respectively) that cannot be supervised within the Program, so South African specialists in their fields have been accepted as supervisors. The students have registered at the University of Natal, but will remain working at the department of Biology in Maputo.

Table 4: Training for graduation within the Mozambique Bilateral Program.

Year	Course	Student number	Degree
1987-90	General oceanography, 4-6 weeks in Sweden	3-4 per year	--
1988	Licenciatura research project	5	Accepted for licenciatura
1991/92	same as above	5	Completed licenciatura
1991/92	M.Sc.	5	Accepted for M.Sc.
1994	Ph.D. M.Sc.	1 1	Completed Ph.D. Completed M.Sc.
1995	M.Sc. Ph.D.	1 1	Accepted for M.Sc. Accepted for Ph.D.
Plans for 1996	M.Sc. Ph.D.	3 2	Completed M.Sc. Accepted for Ph.D.
1997	M. Sc.	2	Completed M.Sc.

Note: * Swedish student.

The topics selected for M.Sc. (and Ph.D.) theses have little in common. Instead of stimulating cooperation, this circumstance contributes to isolating the activities and to lose time due to different working pace when coping with the difficulties met. Nevertheless, it has contributed to a basic competence, which is valuable in the present situation of increasing interest in the marine coastal resources.

3.6.1.3 Infrastructure and equipment

When SAREC stepped in, in 1985, and offered support to the Faculty of Biology it was found that in many respects the task implied starting from scratch (cf. Section 3.1). The natural place for the activities, the Marine Research Station on the Island of Inhaca had been closed since independence. But thanks to the university authorities, the surviving technical staff and guards, the buildings and the collections had been maintained and could be used. On the contrary, basic field, laboratory and logistic equipment had to be restored. So far, Sida/SAREC has financed the equipment of the laboratories of the Inhaca station. Sida/SAREC has also agreed to make two major investments in 1996/97[9]. The new large-scale solar power station will revolutionize working conditions in the laboratories.

The Inhaca Marine Biological Station has an excellent location but requires urgent upgrading and improvement of some of the old and still deteriorating buildings and key infrastructure. Some improvements have been made (e.g. to the electrical power system. Further, the Dutch government has decided to provide some additional funding. About USD 250,000 has been estimated to be required to renovate these facilities to level for even basic operation and living on site.

[9] Additional refurbishment of the laboratories and a large scale solar-power station.

It is a slow process to build-up an infrastructure of major installations, which is necessary to secure the supply of electricity and freshwater and to create laboratories for advanced scientific work. This is particularly true at times when the administrative bureaucracy increases dramatically. The inefficient administration and red-tapes not only hamper purchase and import of chemicals or instruments, but also reduce the possibilities for regular maintenance and investments.

At the UEM, the Biology Department has the basic equipment necessary for licentiatura and perhaps masters courses, depending on what topic master students want to work on. So far, there is no equipment for research or for participation in international research programs. And the limited equipment does not allow staff to move into more analytical research related to understanding and defining dynamics and interrelationships of the coastal environment and human impacts. According to the head of the department, Mr. Adriano Macia, the faculty under present conditions has to search for funds from external aid.

3.6.2 Gender issues

The program has not had a specific gender profile - to promote female researchers. However, of the seven M.Sc. students supported by the program three are female. Among the students of the Department of Biology 58 are female and 39 male. The previous head of the Department of Biology was a woman.

3.6.3 Fulfillment of objectives, effectiveness, relevance and impact

The discussion on effectiveness in Section 2.8 above covers most of the observations in the case of the Mozambican program. The originally stated objectives of this program were changed as they proved unrealistic. This change of objectives - to adapt to reality - may not have increased the effectiveness of the program, but certainly the relevance. Overall, in spite of the great problems that followed the independence, the program has, in substance, provided the requested basic results. The activities, output and strategy have reached expected results and have had high relevance. There is now a functioning institution in marine biology and progress has been adequate.

Progress has been substantial as regards the institutional capacity-building. This achievement has prepared the ground for an ecosystem based research aiming at sustainable coastal zone management in Mozambique. Based on the present resources, however, it would be impossible to establish such a research program. Therefore there is a need for improvement of human capacity, institutional facilities and equipment, and enhanced contact with other marine centers via networking, training and project participation.

While there is an impact on research, university capacity and governmental administration, it is still too early in the development process to be able to measure impacts on management of coastal zone resources, particularly at the community level.

3.6.4 Problems

It may be argued that it has taken a long time and considerable resources to take the first steps towards a *"sustainable institutional capacity in marine science"*. It must be recognized, however, that the conditions have been adverse in Mozambique, where 17 years of guerrilla warfare followed the independence in 1975. Further, the country has become totally dependent on foreign aid for its development finance. In the wake of the civil war

human, institutional and financial resources were drained and personal security was fragile. One of the two botanists of the department was killed outside Maputo and the head technician of the Inhaca Marine Station was murdered on the Station premises. Turbulence in the central administration, at times growing to choking bureaucracy, reduced contacts with the surrounding world and precluded or slowed down delivery of vital equipment.

The following is a listing of the major problems identified by the Mission either directly or through interviews with program staff. The list is not in any priority order, but if funding becomes a critical constraint, it could be put in order of priority.

- Facilities at the Inhaca Marine Biology Station and equipment limitations (cf. Section 3.5.5) are a serious problem that merit detailed discussions on how best to improve the infrastructure, critical to carry out the future research programs. Adequate core facilities are a prerequisite for an effective research program.

- Financial administration is a very serious constraint identified by the project staff. Financial accounting is controlled centrally at the UEM headquarters office in downtown Maputo. Project leaders complained that accounting was both slow and inaccurate, e.g. incorrect figures were given on expenditure and information on current balances were only available after long delays and protracted requests. A detailed review (Sida/SAREC funded) by a local, internationally recognized, accounting/financial management firm is suggested to evaluate the feasibility of establishing a more decentralized accounting system at the faculty or department level[10]. In fact, such a system is being used now, at least in a primordial form, as a backup to provide the project leaders with the information they need. This duplication is a waste of resources.

- Sida/SAREC should take a special note and seek to correct the delayed fund release problem, as many of the researchers feel that the delays are due to delays in Sida/SAREC processing of their requests.

- Equipment purchasing has been very slow and difficult. The Mission was given examples of the long delays (12-18 months) in obtaining critical equipment or even relatively common items, such as small outboard motor spare parts that should have been available through local agents, but to date have not been obtained. In order to induce staff to work within their own university system Sida/SAREC has, correctly in the Mission's view, insisted that equipment purchasing be undertaken by UEM staff. Unfortunately, this procedure has resulted in inordinate delays in research progress.

- Foreign equipment importation was equally problematic. Custom duties are required to be paid and fund release through the above central administration resulted in a long list of delays and storage charges to cover the equipment held in customs but not released to the project staff. The Mission felt that these types of problems should be able to be solved. One suggestion is that Sida/SAREC seek a clearance from the Government that no duties be charged to research project equipment. If this will not solve the problem perhaps establishment of a particular fund is possible which can be used to pay duties and can be replenished periodically. This is a common problem to all international assistance

[10] A Dutch group has made a project proposal for the reorganization of the central financial management of the UEM. (UEM, Delft University of Technology, Institute for Research on Public Expenditure, IMR&Dconsult BV, June 1995.)

programs in the country, and should be addressed through joint discussions between the government and the international donor community.

- Communication systems have to be developed and telephone system problems removed. There seems to have been only limited communication between the Swedish collaborators and the Mozambique staff and donors and other external assistance bodies working in the region. To some extent the reason seems to have been technical short-comings.

- More needs to be done as regards project and program coordination. In the Faculty of Science and the Inhaca Station there were, in the recent years, research programs funded by SAREC, NORAD, EU, and the Netherlands. However, only recently have there been attempts to induce greater coordination between these programs. More should be done by the donor agencies and the UEM department staff. The Mission suggests that combined meetings be organized during the future research program planning sessions at the UEM. In addition, the system of definition of the research problems and dissemination of research results in Mozambique is still weak. More effort is needed to improve coordination among Mozambican agencies working on marine issues.

- Government support for these research programs is still weak, as almost all national funding is used for staff salaries. Without stronger local funding, the programs are unsustainable. This is likely to be the major future problem faced by the programs and Sida/SAREC. More efforts need to be put here. The Mission recommends that Sida/SAREC make future funding conditional on some appropriate increase in government funding over the course of the next phase of the marine science program.

3.7 Conclusion

For evident reasons there was at the time of the initiation of the Mozambican bilateral program hardly any awareness among politicians and administrators of the great importance of the marine and coastal resources, both in respect of the current situation and particularly for the future. One reason for the Program's development was contact by planners and policy makers with the advanced students of the University/Inhaca Station and participation in regional international conferences (e.g. the Arusha Meeting in April 1993). Finally, the awareness was further strengthened by the increasing exploitation of the coastal zone.

There is no question that the program has had a positive impact on building research capacity in marine sciences and awareness in the area of coastal and marine resource management. The long term outcome of the program is all a question of future resources. The number of scientists is still very limited and the scientific output is promising but still in its infancy. Discontinuing the support would be a disaster.

Amplified capacity-building using a long term approach is highly appropriate, in order to provide the research basis needed to develop an interdisciplinary mode of research. Case studies that have demonstration value of management projects should be promoted, and introduced at the local and regional levels. The Regional Marine Science Program is an additional source of research resources (cf. Section 5), that should be frequently utilized for training, courses, networking, and workshops.

What is needed is a strong proactive move by Sida/SAREC to use its next phase of support as a catalyst to encourage expanded other donor support coupled with increasing national funding of marine science.

The aim for the future will, however, be at a more coherent program for sustainable community based management of coastal marine resources which means removing the serious problems described above and further amplification and refinement of the institution building.

4. TANZANIA BILATERAL PROGRAM

4.1 History

Before SAREC support there were few trained Tanzanian staff in marine sciences, no journal or scientific exchanges and no major equipment. Research at IMS was supported through a number of small grants for specific projects. The former Director of the Institute of Marine Science characterized this period as *"the low point for marine research in Tanzania"*.

At the request of SAREC, the former Director General of Sida Mr. Anders Forsse and Dr. Olof Lindén prepared, in 1986/87, a broad East African marine program, intended to include a planned Tanzanian bilateral program, and the already existing Mozambican program. A positive decision was taken in 1989 by the SAREC Board after detailed planning in connection with a meeting in Stockholm where Dr. Anders Granlund and Dr. Gerhard Hultcrantz from SAREC, Dr. Magnus Ngoile, IMS, Zanzibar, and Professor Adelaide Semesi from the Botany Department of the UDSM met representatives of the Department of Physiological Botany, Uppsala University, and Department of Zoology, Stockholm University. The Tanzanian Bilateral Program was initiated in 1990 (MOU signed in March 1990), involving the University of Dar es Salaam (UDSM) and University of Uppsala and University of Stockholm. Within the UDSM the two counterpart departments were: Department of Botany and Institute of Marine Science (IMS) in Zanzibar.

When the Tanzanian Bilateral Program was planned in 1989 it was explicitly stated that there should be a cooperation between two Swedish university departments (the department of Zoology of the University of Stockholm and the department of Physiological Botany of the University of Uppsala) and the University of Dar es Salaam (UDSM). The two counterparts on the Tanzanian side should be the Institute of Marine Science (IMS), Zanzibar and the Department of Botany. Still, these departments are the cornerstones of the cooperation between the three universities.

In Tanzania, advanced training of scientists was vital for the development both of the teaching potential at the University and for marine environmental research. Since the IMS was the center of marine science in Tanzania, it became the starting point for the cooperative activities, particularly so as there was a close contact between IMS and the department of Botany at the Dar es Salaam campus. The two Swedish university departments in close cooperation with UDSM and IMS initiated the build-up of IMS, later shifting the emphasis to the Department of Botany and its Microbiology unit while support of the Department of Zoology and its activities (mainly basic education) has remained minimal.

Initially, the number of young students qualified for higher training was limited. A scholarship program for graduate students has recently been introduced, however, and paid from the bilateral program budget. The scholarship program has attracted many qualified students. Furthermore, the renewed use of the Kunduchi Marine Biological Station of UDSM for regional and bilateral courses and field activities of the UDSM may stimulate the interest in marine sciences.

The aim has been that there should be both Tanzanian and Swedish scientists from the above mentioned departments involved in all bilateral M.Sc. and Ph.D. projects. In Tanza-

nia students are being supervised jointly by Tanzanian and Swedish scientists. Cooperation between Swedish and Tanzanian students/scientists does also exist in some smaller research projects, which are not funded by the bilateral support but were integrated in it, to cover subject areas or needs that could not be addressed with bilateral funds.

There is, thus, a close cooperation between the Swedish university departments and their local counterparts and between Swedish and local scientists and their M.Sc. and Ph.D. students involved in the projects. Naturally, the cooperation is within the limitations of the program, e.g. the available supervisor capacity and the logistic constraints.

A broader development of the cooperation in marine environmental science in Tanzania towards resource management needs identifying and addressing study areas where specific knowledge or elementary education is lacking. This does not only apply to various fields of marine science but also to socio-economic and other interdisciplinary aspects where a few projects have been started in connection with the regional marine program. These projects are executed in cooperation with Swedish university departments outside the realm of the bilateral marine science program. Such a broad development of the marine environmental science is necessary due to the presently increasing and planned future exploitation of the coastal zone. However, since the core research effort should cover a sufficiently broad subject range to support the overall development of marine science, the number of projects more directly aimed at management problems will be limited in the near future.

The overall coordination of the program is taken care of by Dr. Ngoile (presently replaced by Dr. Julius Francis), Professor Semesi, Docent Pedersen and Dr. Johnstone. The administration is shared between the universities that receive the funds.

Due to the lack of higher level expertise in virtually all areas, support was at the start of the Program given as broadly as possible. Thus, at the onset of the program the major emphasis was on addressing the urgent need of Tanzania to increase recruitment to marine sciences, to increase the level of training of research staff and collect data, which are essential in developing management strategies for coastal areas. These major priorities have been kept during the five years the program has been operational.

4.1.1 Main events

The first phase of the program was to supply basic equipment. Thus, making it possible for the two Tanzanian institutions to plan research more independently, within the framework of the program and according to the needs but also interest of the scientists involved. After the first 18 months the training and research in marine environment was starting to take shape. But still it was only a small beginning and the major constraints identified for planning and execution of research projects included: inadequate qualified manpower, limited infrastructure, inadequate international contacts and insufficient financial means.

After equipment and basic logistic support had been installed at IMS, it was possible to start training of available and interested students and to conduct fundamental research. In 1992/93, the immediately available students had been accounted for in the Program and, as a response, the Bilateral Marine Science Program Scholarships were introduced, administered by the UDSM via IMS. As a result of the scholarship system, availability and quality of students improved and the Program developed a research profile which encompassed all of the subject areas supported. In 1993/94, a broader interaction began with university

a response, the Bilateral Marine Science Program Scholarships were introduced, administered by the UDSM via IMS. As a result of the scholarship system, availability and quality of students improved and the Program developed a research profile which encompassed all of the subject areas supported. In 1993/94, a broader interaction began with university institutions, e.g. Department of Chemistry and Department of Geology, and with local government bodies.

Recently, production of publications has increased particularly in marine botany. The Department of Botany at UDSM has began to develop its program more rapidly. As a step towards sustainability, IMS was able to attract a significant EU grant. The Ministry for Education and the Ministry for Environment increasingly use IMS as an advisory body and have focused attention on activities of environmental concern, e.g. tourism and algae farming.

4.2 Objectives

The overall aim of the program as specified in the program summary document was: to assist Tanzania in building research capability in marine sciences, which would provide a basis for sound environmental management as well as a platform for future expansion and development of a self sustaining marine research capability. In accordance with available expertise in Tanzania and Sweden, the program focused on marine botany and marine ecology.

As in the case with the Mozambique bilateral program, objectives have not been clearly specified and stated. In the first application, for 1990-92, no clear objectives have been formulated. In the next application (1992-94) the major objective is:

- to contribute towards remedying the situation by increasing the marine potential in the country.

To establish possible changes in the objectives in the program, the Mission held discussions with program staff in Tanzania and the following goals and objectives were derived from these discussions and the applications:

- **Goal:** to assist in the development and sustainable continuation of marine science and related fields in Tanzania (Renewal Application, February 1993, p. 3).
- **Objective 1:** Improved infrastructure and human resources.
- **Objective 2:** Improved knowledge in areas of oceanography, marine chemistry/nutrient dynamics, benthic community structure, mangrove ecology, seaweed farming,fisheries biology and inter-linkages between certain biotopes within coastal zones.
- **Objective 3:** Improved international contacts and interactions.

4.3 Structure, Organization and Mode of Cooperation

On the Tanzanian side the cooperating institutions are: the Institute of Marine Science (IMS), Zanzibar and the Department of Botany, both belong to the University of Dar es Salaam (UDSM). IMS is a research institute, headed by a Director, and provides the platform for post-graduate research students from the teaching faculties of UDSM. It has, within the UDSM, the same status as a faculty. The Department of Botany provides

Sida/SAREC's selection of the institute and the department as Tanzanian cooperative partners, seems to have been appropriate at least for the initial stages of the marine science program. Both organizations have a research mandate, committed staff and teaching responsibilities in marine science.

The IMS was established in 1979, and it is currently located in the premises of the former East African Marine Fisheries Research Organization (EAMFRO) of the defunct East African Community. There are plans to relocate the IMS to Mkokotoni, 40 km north of Zanzibar Town. A decision on relocation in or outside Zanzibar Town is urgent as the present premises are inadequate to accommodate present activities and cannot stand any further expansion. The aims and objectives of the institute are:

- To undertake research in all aspects of Marine Sciences.
- To provide postgraduate training and in the future establish undergraduate studies in accordance with the country's manpower requirements.
- To provide advisory and consultancy services in marine affairs.
- As part of merging theory and practice engage in exploitation of marine resources.

The research staffs of the Tanzanian institutions and counterparts, involved in the Program are as follows:

IMS: 17 persons, 12 of them are now studying for a Ph.D., distributed over four sections as follows: Bioresources and Ecology (7); Chemical and Environmental Marine Science (2); and Physical and Applied Marine Sciences (8); and Marine Affairs. There is a plan to increase the research staff to 32 people. There are nine technicians and 50 supporting staff.

The UDSM: Department of Botany and Applied Microbiology: 13 persons, 3 of them on Ph.D. programs, and 12 technical staff. The Marine Biology Section has 6 academic staff, two with a Ph.D., and 9 technical staff.

Uppsala University: Department of Physiological Botany: 11 persons, 3 of these foreign specialists (E. Carpenter, E. Oliveira, J. Wouters).

Stockholm University: Department of Zoology: 7 persons.

Technical administration is handled by the individual project leaders based either in Zanzibar or Dar es Salaam. Program financial administration is managed by the Finance Officer of UDSM. The IMS has its own account section and has received assistance in accounting from SWEDMAR. The Mission was not able to make a detailed examination of the administrative mechanisms in place other than to note that the accounting and financial reporting of IMS were about average for a developing country institute. However, regarding financial management of the UDSM there are problems and delays in reporting.

The evaluation mission was told by both the Vice Chancellor and Chairman of the Faculty of Science that there was strong UDSM support for marine science. The Mission was not able to obtain quantitative data on the relative level of support for marine science versus other similar programs at UDSM. However, it was clear that UDSM was not in a strong financial position as 80-90% of its operational funding comes from foreign donor organizations. Considerable effort should be focused on defining and where appropriate increasing the priority given to this marine science program by the university, as the general economic status of the university improves in the future. This priority can be judged by the allocation

of resources, both staff and funds (capital and operational) to this program. Increasing support from the university (and the governments of Zanzibar and Tanzania) is a prerequisite for the long term success of this program.

Research priorities in marine science are established by UDSM staff in association with Tanzania Commission for Science and Technology. This priority setting process needs more emphasis in the next phase as outlined in the following sections. The Mission was not able to meet with this Commission, but follow-up contact by Sida/SAREC staff as part of the next phase negotiations is recommended.

More detailed examination is required by Sida and UDSM regarding the future of the Kunduchi Research Station, which is used by the University and Fisheries Department. Currently, there seems to be some ambiguity in respect of ownership of the premises. These facilities are presently in a fairly bad state and need rehabilitation. However, the current rate of beach erosion place the buildings in a risk zone. Therefore serious considerations have to be made concerning the use and rehabilitation of the Kunduchi Research Station. There is no doubt that the University needs a research station in Dar es Salaam for their marine and coastal programs, and undergraduate training. A rehabilitation of the Kunduchi Research Station is important for advancing the marine sciences on the mainland. A division of labor between IMS and departments of Botany and Zoology must be established.

A new Sida initiative in marine and coastal resource management is currently being planned, which, if realized, would utilize the Kunduchi Research Station. The site has purposely been selected, firstly as it is in the middle of the proposed project area, and secondly since it would foster a cooperation between the ongoing Sida/SAREC bilateral program, and the planned program. It is planned that the Bilateral Program and the proposed program would have a close collaboration to take advantage of the synergetic effects.

4.4 Finance

From the start until July 1995 a total of SEK 10.7 million has been allocated to the Program. The program started on a small scale - SEK 0.5 million the first year and reached a peak in 1993/94 - SEK 3.0 million. The Swedish part of the total allocations was during the initial stage some 30%; 40% for the next period 1992/93 - 1993/94; 35% for 1994/95; and 36% for the fiscal year 1995/96. This pattern follows fairly closely the overall picture of the Swedish share of development projects. It also shows that considerable financial resources are transferred to the Tanzanian institutions. Moreover, the Swedish costs are to a large extent derived from the financing of transfer of knowledge and research exchange. The budget for the current 18 months 1995/96 - 1997 totals SEK 4.4 million - USD 0.68 million (Table 5).

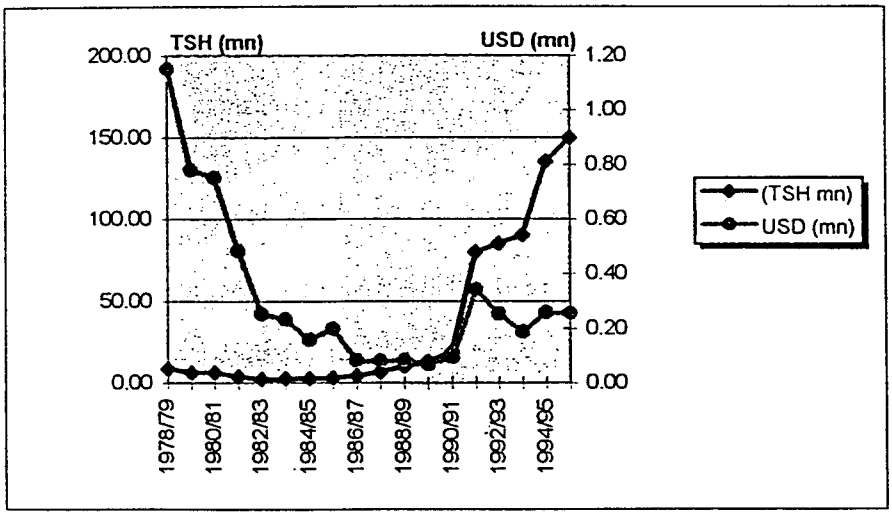
The Tanzanian contribution to the marine science program is naturally of greatest importance and is an indication of the priority given to this sector. Unfortunately, the Mission did not get access to local funding of the Department of Botany, but in the case of IMS a clear pattern appears as visualized in Figure 2. During 1978-1986 there is a drop in absolute government funds to the IMS and in real term the drops is much greater. From the mid 1980s, a small increase can be noticed in local currency, but in USD the decrease continues. The lowest point is reached in 1989/90 with only some USD 70,000 allocated to the IMS. The start of the Swedish assistance to the marine sciences is clearly visible also in the Tanzanian allocation to IMS. The bilateral program started in 1990/91, and at the same

time Tanzanian contribution, also as measured in USD, started to raise and leveled off at USD 250,000 annually. Thus, a conclusion can be drawn that the SAREC bilateral program did not only contribute with Swedish resources to marine sciences, but also ensured that a larger share of the scarce Tanzanian resources was allocated to this field.

Table 5: Budget Tanzania Bilateral Program, Fiscal Year 1995/96 (18 months) (SEK '000)

	Tanzanian institutions (IMS)	Stockholm's Univ. for Tanz. inst	Stockholm Univ.	Uppsala Univ.	Total
Salaries			350	400	750
Consumable	330		100		430
Literature		150			150
Equipment		750			750
Travel	130	130	300	300	860
Subsistence grant		150			150
Field work, allowances	850				850
Contingency, unforeseen, overhead	344		62	55	460
					0
Total	1,654	1,180	812	755	4,400

Figure 2: Government Grants to IMS, Fiscal Years 1978/79 - 1995/96



4.5 Mode and Type of Intervention

The mode and type of intervention comprise financial support, personnel in the form of training of technical and administrative staff, and researchers. The support has in the case of Tanzania not been so intensive in terms of management and technical training and assistance as in the case of Mozambique. There has, however, been a strong exchange of researchers coming from the two Swedish counterpart universities. A general comparison

between the two bilateral programs would put the Tanzanian program higher on the exchange and training of researchers, while Mozambique was more on technical support and training in basic research methodology.

4.6 Findings and Analysis of Progress

4.6.1 Achievements

Institutional development in Tanzania is now reaching the level where there is a critical mass in marine science, sufficient to address the interdisciplinary research needs of the coastal zone. For instance, a related project on the development of the National Biodiversity Plan was done largely by national scientists. The marine science program now requires expanded input to broaden the coverage of the training, provide some staff depth and to move the research program into more interdisciplinary approaches. Apparently there is not a manpower development plan for UDSM and IMS related to the marine sector. It may be timely to begin such a plan.

4.6.1.1 Scientific results

At the University of Dar es Salaam there were also initial difficulties as regards students, equipment and logistics. They were, however, easier to overcome than in Mozambique, except for one great problem that has worsened during the last few years, viz. the facility of IMS.

After a weak start, an efficient use of available resources, including the participating staff of the counterparts at the universities of Stockholm and Uppsala, has lead to an increase in the number of masters and Ph.D. students. So far four students have completed their M.Sc. and some of them may continue towards a Ph.D. Of the total of seven M.Sc. students the remaining four are expected to complete their degree in 1997. One of the four Ph.D. students recruited in 1992, Mr. M.S.P. Motolera, completed his Ph.D. in February 1996. His thesis was on Photosynthesis, Growth and Light-Induced Stress Responses in the Red Alga *Eucheuma denticulatum*. Mr. S. M. Mohammed will follow in his footsteps, while Mr. S. Ndaro is expected to complete his degree in 1997. A Swedish student, Jonas Collén, completed his doctoral thesis in 1994 and took his Ph.D. degree at the Department of Physiological Botany in Uppsala, with support from SAREC, Swedish Research Program

In 1992, the Program presented a plan for the "Marine Research at Zanzibar Ecological and Physiological Studies in Coastal Marine Ecosystems". It was a well considered outline, aiming at relieving the critical situation in marine science in Tanzania by increasing the research potential. Long-term projects were built on joint training and research activities. The partners were primarily the Institute of Marine Sciences (IMS) and the UDSM Botany Department, interacting with the Zoology Department and the Department of Analytical Chemistry at the University. The research areas are all in the coastal zone, as follows:

1. Inventory and health status assessment of fauna and flora.
2. Dynamics of biotic and abiotic factors of the main ecosystems.
3. Natural versus anthropogenic coastal phenomena and means of their management.
4. The aquaculture potential and its economic importance.
5. The fisheries potential and plans for sustainable fisheries development.
6. Public awareness.
7. Waste water treatment by cultivation of algae.

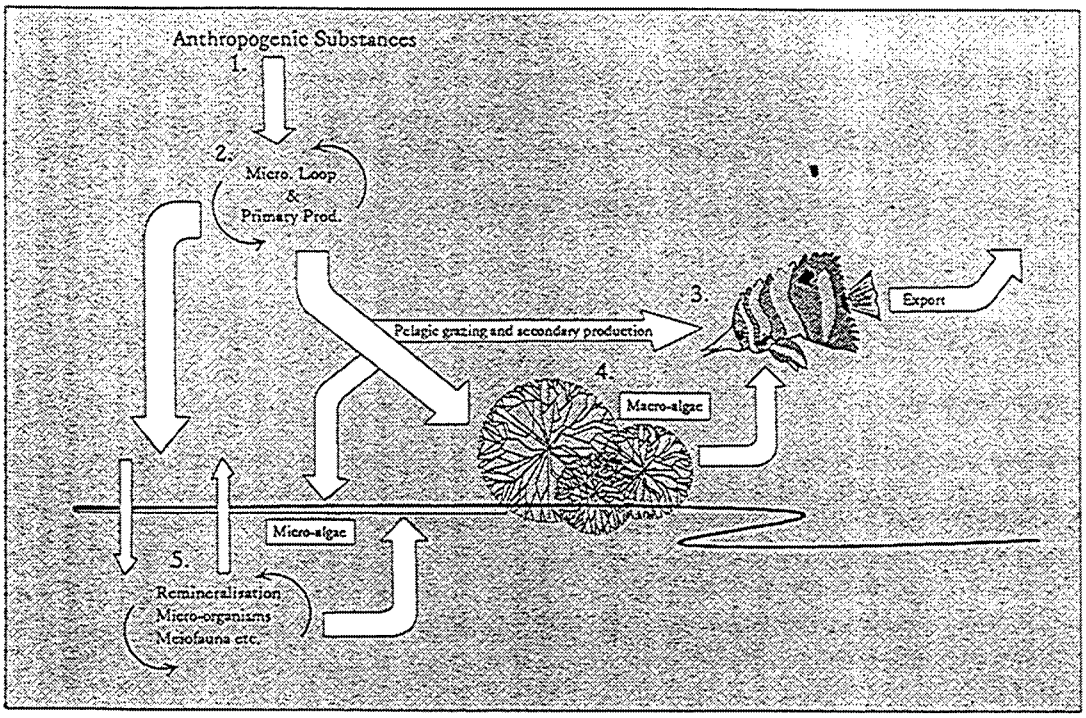
8. Carbon and nitrogen metabolism of marine algae.

Within this framework a variety of projects are worked on. The Program has managed to launch most of its proposals, although both objectives and activities have had to vary in order to match the changing environment, both within the University and in the field. The heavy growth of population and tourism in the coastal zone, combined with the increase in agriculture and industry, exposes the coastal waters to increasing stress. Research is now directed towards these management needs.

In connection with the progress in the research projects it was felt that there was a clear need to enhance the production of data usable for modeling or predicting future trends for management. Interdisciplinary projects are promoted and interlinkages between subject areas built in order to facilitate analyses of critical components of the structure and function of coastal ecosystems. This has been done with considerable skill as is shown by the illustration (Figure 3), where the figures refer to the following research topics/projects:

1. Water quality and nutrient transfer.
2. Pelagic microbial loop and primary production.
3. Fish grazing and population dynamics.
4. Algae distribution and physiology in natural versus anthropogenic environments.
5. Benthic nutrient remineralization and infauna population dynamics in natural versus anthropogenic systems.

Figure 3: Schematic representation of a tropical coastal ecosystem.



Source: Sida/SAREC Bilateral Marine Program, IMS, UDSM. Report and renewal application 1994.

The application of achieved results have also contributed to broadened contacts with both governments and industry where IMS and Botany staff is serving as advisor on coastal management issues.

Research projects and results have been briefly summed up in "Sida/SAREC Bilateral Marine Science Program" (1995), including two lists of publications and reports by scientists, participating in the Program; the M.Sc. theses are not included. Most of the articles published in international, refereed scientific journals are available for evaluation. A selection of papers is attractively published in a Special Issue of Ambio[11], dedicated to the Sida/SAREC "Program Research and Capacity-Building for Sustainable Coastal Management". Of the 35 papers listed, 25 were published in international refereed journals, 16 of them in Ambio (Table 6).

Table 6: Papers published by the Bilateral/Regional Marine Science Program in international peer-reviewed journals.

Subject	Ambio	Professional scientific journals
Botany	3	5
Zoology and animal ecology	4	3
Oceanography	3	1
Geology	2	
Socio-economics	2	
Environmental resources	2	
Total	**16**	**9**

Excluding reports, gray publications and two papers still in manuscript, the material contains 35 published papers which can be distributed amongst subjects as follows:

Botany: 14 papers; mainly on algae, particularly physiology (12). Two papers on mangrove vegetation.

Zoology: 8 papers; mainly ecology, meiofauna and related problems (5).

Marine geology: 3 papers.

Oceanography: 4 papers.

Socio-economics: 2 papers

Environmental resources and coastal management: 2 papers.

Of the nine papers published in professional scientific journals five were produced in physiological botany, which is the most successful team from this point of view, closely followed by zoology. Their score of refereed papers numbers 8; zoology scores 7. The studies of algae form an impressive contribution to algae aquaculture, important because of the economic and social significance of this activity in the region.

[11] A Journal of the Human Environment, Vol. XXIV, Number 7-8, December 1995, Stockholm

Still most of the papers are descriptive, though of an even and good quality. The production can of course be related to the input of supervisors, the department size and number of participating staff (cf. Section 4.3).

The development of the research areas and the training results seem to show that the organization established for the Program and the resources available for its activities are in a fair way to build a strong regional research institution, whose future however, depends on the restricted facility for the activities in Zanzibar.

4.6.1.2 Training

In the first year it was envisaged that one Ph.D. student and six M.Sc. students should begin their studies supported by SAREC scholarships. Soon it became obvious that the number of available and interested graduated students was quite small. Due to lack of local funds those who were interested had gone to the private sector or into governmental agencies. Two were, however, engaged for studies at the University of Göteborg, financed from the Regional Program. While there were difficulties in recruiting the M.Sc. students, there were in 1992 four staff with Ph.D. scholarships: one working on nutrient dynamics, registered at Stockholm University, one (dynamics of meiofauna) at Stockholm University, one (physiology of macro-algae) at Uppsala University, and one (phenology & ecology of mangroves) at Dar es Salaam University. Besides training in Sweden and at IMS, Zanzibar they attended a number of regional courses.

In 1992, student scholarships were set aside for use by UDSM in marine sciences. It was decided that the total number of individuals to be supported at any time was seven M.Sc. and four Ph.D. students. In 1993, the first three M.Sc. students were enrolled and the number of Ph.D. students increased to five, adding one (dynamics of pelagic fish) at Dar es Salaam University. In 1994, there were three Ph.D. students and five M.Sc. students, a number which has since (1995) increased to five and nine respectively. (1+2 being financed through the Regional Program for East Africa.)

As indicated earlier this is a very important accomplishment. Most training seems to be proceeding well and most degree training has been of the "sandwich model" where the student spends most time in his/her own country and works on a local research problem.

At most levels training and research in the field follow an integrated pattern according to the character of the marine environment and the perceived management needs, as is exemplified from the following list of present and planned main themes:

1. General water quality and nutrient transfer (1 supervisor + 4 IMS personnel; 3 groups on different aspects).
2. Pelagic microbial loop and primary production (2 supervisors, plus 2 UDSM/IMS personnel; 3 groups on different aspects).
3. Fish grazing and population dynamics (2 IMS personnel, interactive with a SAREC-funded project in Sri Lanka).
4. Algae research: 7 sub-sections where 5 supervisors interact with 7 M.Sc. and 2 Ph.D. students.

institutions via the SAREC research program, there would seem to be excellent opportunities to better utilize the existing manpower at IMS and the Department of Botany to assist in the implementation of this project. In addition the work of the Tanzanian Fisheries Research Institute (TAFIRI) on marine science and that of the UDSM should be evaluated as part of this review. The Mission was informed that there was no overlap as the TAFIRI station at Kunduchi, adjacent to the UDSM laboratory dealt with applied research that has application potential by the private sector, e.g. shrimp farming, which is, however, a common interest in coastal resource management. Also, the subdivision will likely become more blurred as competition for funding becomes more intense in the future.

4.7 Conclusion

The Program has contributed significantly to establish the issues related to marine and coastal environment and resource management in Tanzania. It has also contributed to strengthen the research capacity in this field. The research community has been established and so have international contacts. It is the opinion of the Mission that the necessary first phase has been completed. The Bilateral Program now has to enter a new phase, where some issues and constraining factors have not yet been satisfactorily solved. However, the second phase comes with new challenges. Among those are the need for a broader interdisciplinary approach to the problems, and to establish mechanisms where the research results are disseminated and translated into policy actions affecting institutional, planning and legal framework as well as resource allocation to integrated coastal zone management.

In addition, as this capacity-building is almost being completed, the Swedish collaborators should be encouraged to move more and more of the responsibility for planning and management of research and training programs under the control of Tanzanian staff.

5. EAST AFRICAN REGIONAL MARINE SCIENCE PROGRAM

5.1 History

The origins of the Regional Program can be traced to the late 1980s. In 1989 a prefeasibility study was conducted, and in December of the same year at a workshop in Dar es Salaam, an agenda establishing the key research issues for the program was defined. A follow-up meeting was held at Inhaca in 1991 leading to a concept paper (idé-PM), which was presented to the SAREC board later that year.

5.1.1 Main Events

1. Training via a series of short courses (9) on topics as varied as Seaweed Physiology and Cultivation to Diving Education (176 trainees, all are assumed to have completed these courses); further short courses are planned this year;
2. 1991 Workshop at Inhaca;
3. 1992 Royal Colloquium in Stockholm;
4. 1993 the Arusha Policy Conference (the resolution is appended in Appendix 3);
5. 1993 and 1994 Royal Colloquium;
6. A second Policy Conference is planned in the Seychelles in November 1996 as a follow-up to the Arusha meeting.
7. Research in physical oceanography, coral reefs, marine geology, environmental economics and sociology was initiated.
8. Preparation of the Handbook *The Fauna and Flora of the Seashores of East Africa.*

5.2 Objectives

The objectives [12] of the Regional Marine Program in East Africa are as follows:

- Strengthening the national research capacity within the marine field, especially concerning coastal ecology, natural resources and environmental issues;
- Strengthening the multi-disciplinary approach in research in relation to these issues, where also social and socio-economic problems should be analyzed;
- Strengthening regional cooperation by stimulating contacts between individual researchers and between institutions in various countries;
- Initiating cooperation where e.g. SAREC's bilateral programs are involved, but even try to seek to stimulate cooperation where other donors programs will become involved;
- Seeking to improve cooperation between various donors to enhance efficiency of the programs;

[12] These objectives are stated in "Stöd till regionalt forskningsprogram kring miljö- och utvecklingsfrågor i kustzoner", SAREC InsatsPM 1993-05-23, p 12.

- Disseminating the results of the programs to insure that they will be applied in the development process.

The major components activities of the Regional Program - including the Caribbean and South-East Asia - to reach the objectives are specified in the documents and completely correspond to the activities listed in main events (Section 5.1.1).

5.3 Finance and Structure

The Program has been administered totally from Sweden through a facilitator. The networking structure and links to other donors have provided the Program with great flexibility and a positive performance.

The Program started on a small scale, the first phase spanning the three years 1990/91 - 1992/93 a total of USD 600,000 were allocated, of which over 70% was for the last year. The second phase saw a large expansion of funds and activities as follows: 1993/94 USD 1.7 million; 1994/95 2.15 million and 1995/96 (18 months) 3.43 million[13].

5.4 Mode and Type of Intervention

SAREC has supported the Regional Program with financial resources that have been used for seminars, colloquiums, workshops, training. The Program has provided mostly know-how and funds for its transfer. Modest amounts of equipment have been provided through the Regional Program.

5.5 Findings and Analysis of Progress

5.5.1 Achievements

5.5.1.1 Results

Within the regional framework and using its resources, the Program has been quite progressive since its start in 1992. The activities are closely related to the current aim of the Program. The thematic focus of the Program was environmental and natural resources management. Results were attained in fields where there had been a need to develop knowledge or more practical skills such as diving. The decision on what subject to focus on has been based primarily on suggestions from specialists or people involved in coastal zone management. The activities supported included courses, seminars and workshops.

Short courses (one - two weeks) were often arranged in several steps, held one in each participating country and followed by a more advanced qualifying course. The number of courses arranged during 1990-95 were as follows: 1990: 1, 1991: 1, 1992: 2, 1993: 2, 1994: 4 and 1995: 1. Many of the courses were arranged in conjunction with IOC.

The workshops were of varying significance. Some, e.g. the Arusha Workshop and Policy Conference in April 1993, were co-sponsored by the World Bank and attended by representatives of governments and the private sector. They have been important for laying down

[13] The total amount includes the support to the Caribbean and South East Asian Programs, which share is 20-30%

the general outlines for the development of the regional activities and setting the priorities for regional marine research.

The regional courses are long-term in-depth courses which favor cooperation and the use of the same or comparable techniques both in field work and in analytical studies in the laboratory. The key elements of these courses have been quality in research, theoretical background, advanced laboratory technique and good laboratory practice. Many of these activities have been cosponsored by other organizations or institutions. Students from East Africa (Kenya, Tanzania and Mozambique), Sri Lanka and Chile have participated. One course started in 1992 (physical oceanography), the others in 1994 or 1995.

The subject areas supported are as follows:

1. Physical oceanography started with in-depth studies early and their courses have been particularly rewarding. They began with three months theory and practical instrumental training at the University of Göteborg which was followed by research and thesis writing at their home institutes. The first course (1992-94) had six students, four of which completed their M.Sc. in spring 1994. The second course (1995-96) has eight students. The Ph.D. program (1994-98) has four students (all from Sri Lanka).
2. Coral reefs. University of Stockholm and Department of Zoology, UDSM one Ph.D. student and two M.Sc. candidates.
3. Marine geology and geochemistry. University of Stockholm, Department of Geology and Geochemistry, and UDSM two Ph.D. students, and UEM one M Sc. student (from Mozambique) .
4. Social and cultural aspects. University of Stockholm, Department of Social Anthropology, and UDSM one M Sc. student
5. Resource economy. University of Göteborg, Department of Environmental Economy, and UDSM one Ph.D. student and three M.Sc. students.

The regional courses are an efficient and economical way of producing Masters and Ph.Ds with limited local resources.

To date there has been an encouraging move towards research in a variety of different disciplines within biology, physical oceanography, marine geology, social and cultural research, and resource economy. Gradually, the Program has included awareness building and information dissemination among its activities.

5.5.1.2 Training

Training was and will continue to be an important need for the region. The level and type of training offered through the Regional Program was dependent on local facilities for the hosting of the courses; the quality of the research projects was dependent on the quality of the students and scientists most of whom had been trained by attending the courses, seminars, workshops and other activities of the Program. Some new equipment has been brought to the region in connection with the Ph.D. projects under the Regional Research Program and additional resources will be provided as part of the more systematic research programs that have been launched for the ongoing project period.

The Regional Program is an important complement to local training programs. Short-term courses cover a range of subject areas, filling gaps in local training or giving specialized information in fields where there is a need to develop the knowledge at different levels.

Similarly, workshops and seminars are often complementary to regional research programs and may serve to develop knowledge in coastal zone management. Long-term courses in physical oceanography are part of Masters or Ph.D. training and connect to the extended research program that has been initiated for a range of field topics, e.g. physical oceanography, coral reef issues, marine geology, environmental economics, and social and cultural aspects.

Future training must also keep pace with the shifting research needs and it is expected that these needs will require researchers with wider disciplinary backgrounds. For instance, there is still a limited number of social scientists working in the region. It is expected that in the future marine research will involve more community based management research and participatory research assessment methods.

5.5.2 Fulfillment of objectives, effectiveness, relevance and impact

Most of the six objectives of the Program as listed in Section 5.2 have been fulfilled at least in part; namely: objectives 1,2,3,4 - strengthening the research capacity, multi-disciplinary approach, regional cooperation and initiating cooperation with the bilateral programs. In this respect the Program has been effective. In fact the program has served a pioneering role in fostering multi-disciplinary approaches to the regional problems particularly the inclusion of the social sciences.

There has been less achievement in fulfilling the two last objectives: (5) to improve donor cooperation and (6) the dissemination of research results. The former may be a reflection of the real difficulties in achieving donor cooperation. However, the latter is an item that has to be addressed more specifically during the next phase.

Overall the Program has a high relevance and it has served as a useful complement to the bilateral programs. The organization, objectives and approach of the regional program are a useful tool to cement the uncovered components of the bilateral programs and to introduce new approaches into these programs.

The Regional Program has had a significant impact in promoting policy and public awareness on marine science and coastal resource management, mainly through the Royal Colloquiums and the policy meetings of the type of "the Arusha Meeting". However, if the resolution is not turned into implemented policies, the impact will not be of any significance. It is too early to give any assessment of the long-term development impact of the Regional Program.

5.6 Problems

Confusion seems to exist in the minds of some of the research staff about what is in the Bilateral Programs and what is in the Regional Program. It seems that this separation is to allow for administrative efficiency and ensuring adequate commitment from bilateral governments. While advantageous, as long as the basic development of the local field stations was the primary goal, Sida/SAREC should for the second phase examine the merits of having bilateral components in each interested country, connected by an expanded network for communication and cooperation. The present WIOMSA could perhaps be developed into such a network.

So far networking has not been utilized to the extent that it might be. The number of participating countries is suggested to increase in the next phase of Sida/SAREC support. In addition, as has been discovered in the case of Mozambique, South Africa has a lot to offer. An expanded network can meet a wider set of regional needs for contact, communication and linkages by staff from and based in the region which should be part of the new development paradigm for this region.

5.7 Conclusion

In summary the achievements have been as follows:

Positive achievements:

- The program has been instrumental in building marine research capacity and awareness.
- There has been a recognition that there is a need for close collaboration between the scientists and the decision makers.
- There has been a significant increase in research activities in the field of marine science
- The regional program provided the platform to fill the gap that other programs could not do.
- SAREC support combined considerable flexibility with very limited bureaucracy and a positive supportive attitude.
- Inclusion of social scientists to contribute their knowledge to coastal area management.

Negative aspects[14]

- There is a need to coordinate the research priorities with the research needs at the IMS. Presently, experts and international researchers come to the institute and work on their own research problems.
- Need for more applied research.
- Difficult to enter agreements on a regional basis with other institutions.
- Problem of an overloaded coordinator; previously there was a problem with only one person coordinating the whole program, now there is one coordinator for each component.
- Problems with the university structures in Sweden and Tanzanian and Mozambique
- Limited achievement in the field of truly multi-disciplinary research.

[14] The negative aspects are valid also for the bilateral programs.

6. STRUCTURE OF PROGRAM COLLABORATION

6.1 Collaboration Between Swedish Institutions

Due to traditions from the 1980s and the more isolated position of the Mozambican Program, contacts for planning and cooperation between the Kristineberg Marine Biological Station of the Royal Swedish Academy of Sciences and other Swedish actors within the Bilateral Program have been confined to the engagement of experts in fields, not represented at Kristineberg or the nearby University of Göteborg. Thus, a tropical limnology expert from the Department of Ecology, Lund University, and a tropical soil ecology expert from the University of Agriculture in Uppsala were engaged for student supervision. During studies in Sweden, Mozambican students became connected to the Department of Zoology and the Department of Marine Botany at the University of Göteborg. Contacts have primarily been with departments and institutions within the Regional Program through connections with the short courses and workshops.

Within the framework of the Tanzanian bilateral program there has been a close cooperation between the university departments and teachers/scientists, involved in the Program: the Department of Zoology at Stockholm University and the Department of Physiological Botany at Uppsala University. The cooperation has been through meetings at an early planning stage and later at courses, seminars and workshops, arranged in Sweden or Tanzania, and in connection with the allocation of facilities and funds. Similar contacts were established with personnel from departments and institutions involved in the Regional Program.

6.2 Collaboration Between Swedish and Local Institutions in East Africa

6.2.1 National and international contacts within the bilateral marine programs

The bilateral programs have assisted marine scientists in Tanzania and Mozambique in both establishing and developing contacts and cooperation with a range of organizations at both national and international levels. Whilst some of these contacts and interactions have gained direct support via the logistic and scientific support offered by the Program, others have been directly negotiated and assisted by the Program and the Swedish counterparts.

At a national level the growing capacity has led to the Programs playing an important role ranging from advisor on policy and planning issues to the provision of research personnel for management oriented investigations. These activities have facilitated close contacts with a number of government agencies and the private sector. For example, in Tanzania the Program provides advisory and research personnel for the planning of a Sida funded assessment of the coastal zone resources around the Kunduchi area.

At an international level the local institutions interact with a number of organizations, e.g. WWF, IUCN and IOC, as advisors and collaborators and provide personnel for investigations and consultancy studies. For example, IMS staff participate in the present World Bank examination of Tanzanian marine resources.

The bilateral programs, particularly the one in Tanzania, have assisted the local scientists to attract funds from organizations and donors. Much of this has been advisory support but services have also been provided in the form of research input or input as scientific collaborators. IMS and the Zoology Department of the Stockholm University jointly applied for

and conducted the EEC-STD3 project in collaboration with scientists from Belgium, Netherlands, Portugal, Mozambique and Kenya. The group involved in this project has presently applied for a new collaborative EU project. This is vital in assisting marine science in the African countries to become self-sustaining in the future.

6.2.2 The regional marine science program

The overall program is coordinated by Professor Olof Lindén, Department of Zoology, Stockholm University, while administrative services are provided by SWEDMAR at the Board of Fisheries, Göteborg, Dr. Magnus Ngoile, IMS/UDSM (currently IUCN) has been the coordinator of the East African part of the program with national coordinators in Mombasa (Dr. Okemwa), Nairobi (Dr. Ntiba), Dar es Salaam (Prof. Semesi), Maputo (Dr. Gove) and Victoria, Mahe, Seychelles (Mrs. Roberts).

Clearly the support of SAREC has been instrumental in inducing collaboration between the Swedish and the national and regional institutions in East Africa.

6.3 Relationship Between SAREC, Participating Countries and the Programs

In the 70s and 80s, SAREC's main task was to contribute to the building of research capacity in poor countries. The significance of knowledge in coastal and marine resources for the sustainable use of these resources and thereby for development became evident fairly recently. The marine programs started as minor projects within the larger country programs.

The intention was to stimulate cooperation between Swedish university departments, marine institutions and corresponding bodies in developing countries. Detailed planning and coordination of the projects were handled by departmental and institute staff of the developing countries, while the administrative services were managed by the university administrations or related bodies. Such marine science activities were established by Sida/SAREC in Mozambique, Tanzania, Somalia, the Caribbean and Sri Lanka.

In the beginning the contact between SAREC and the projects under the Bilateral Programs was fairly weak and the funds available for the projects were small. At the end of the 80s, after the investigation by A. Forsse and O. Lindén, the interest in marine science programs increased. The obvious fact was that the exploitation of the world's coastal areas was rapidly increasing. In the industrialized world degradation was mainly a result of over-fishing, industrial development and pollution, while in the developing countries the main threat was the rapid population increase, due both to migration and high birth rates. The population growth caused increasing pressure on the natural resources by e.g. over-harvesting, erosion and pollution.

Sida/SAREC's efforts to support capacity-building in research, management and sustainable use of the coastal and marine resources were enlarged. In 1989, the above mentioned meeting in Stockholm, hosted by SAREC, opened up for further engagement. At a meeting sponsored by SAREC in Dar-es-Salaam, a united bilateral marine program was planned, to be submitted to the SAREC Board in 1990 for funding. Later in 1992, SAREC launched the Regional Program to further support the development of coastal and marine science in East Africa and the island states of the western Indian Ocean.

At this time SAREC was preparing for a high political level conference on coastal zone management in East Africa. This was a correct timing with regard to the UNCED conference in Rio de Janeiro. On 21-23 April 1993, the Ministry of Tourism, Natural Resources and Environment in Tanzania, the UDSM and SAREC organized a workshop and a policy conference on Integrated Coastal Zone Management. The venue was in Arusha, Tanzania. At the policy conference ministers of environment and natural resources from Madagascar, Mauritius, Mozambique, the Seychelles and Tanzania discussed recommendations from the preceding workshop. At the end of the day they signed a Resolution on Integrated Coastal Zone Management in East Africa and Island States. A follow-up of the recommendations is presently being prepared by a coordinating Interim Secretariat at the Ministry of Tourism, Natural Resources and Environment in Tanzania, which also prepares, together with the Government of the Republic of Seychelles, for a follow-up conference in the Seychelles in 1996.

Sida/SAREC has acted vigorously for the continuation and development of the instituted coastal and marine programs in East Africa and the western Indian Ocean. This is the more commendable as there is only one professional, Dr. Anders Granlund, in Sida/ SAREC in charge of the marine sector. Coastal zone management is one of the three initiative areas of the environmental and natural resource division of the new Sida, which hopefully warrants continuous support for the near future.

6.4 Collaboration with Regional and International Organizations

Future development of the oceans and coastal zones will have regional and international linkages. Therefore, this is an important topic now as well as for the future. This area of collaboration was in its infancy at the start of the SAREC program. Since then there have been increased contacts, but much remains to be done. Linkages with UNEP have been tested, but there seems to have been only limited cooperation to date. A stronger relationship had been developed with IOC.

The IOC (Intergovernmental Oceanographic Commission) was founded in 1960 under UNESCO. The objectives are to:

1. develop, promote and facilitate international oceanographic research programs to improve our understanding of critical global and regional ocean processes and their relationship to the sustainable development and stewardship of ocean resources;
2. ensure effective planning, establishment and coordination of an operational global ocean observing system to provide the information needed for ocean and atmospheric forecasting, for oceans and coastal zone management by coastal nations, and for global environmental change research;
3. provide international leadership for education and training programs and technical assistance, essential for systematic observations of the global ocean and its coastal zone and related research; and
4. ensure that ocean data and information obtained through research, observation and monitoring are efficiently handled and made widely available.

IOC is interested in promoting international cooperation and coordination with other agencies both inside and outside the UN system. Membership is open to any member states or any body of the UN. At present there are 124 member states. The present Chairman is Dr. G. Holland of Canada; the Executive Secretary is Dr. Gunnar Kullenberg of Sweden who is

also a member of the Sida/SAREC Regional Program Reference Group. SAREC has provided support for the involvement of IOC in the East African Regional Committee for the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean (IOCINCWIO) to assist the East African Program with training, workshops, information and links to other regions, e.g. the Caribbean IOC IOCARIBE program. IOC has also assisted with contacts and linkages to other donor agencies such as the Belgium.

The link with IOC has been useful and the Mission recommends that continued support be provided, but the majority of funds should go to the national institutions in the East African Region, under the networking proposal outlined later in this report.

In general, collaboration with most international organizations has been particularly difficult (e.g. those institutions within the United Nations system) due to the recent cutbacks in funding which have caused major restructuring of these organizations and the way they do business. This chaotic situation is not over yet. Therefore, there is a need for a flexible networking approach to collaboration, based primarily on the needs and priorities of the countries of this region.

Other regions have accumulated considerable experience in marine science. More effort is suggested in developing inter-regional collaboration with regions such as Asia. An important beginning has been made through the cooperation with the Coastal Management Center in the Philippines. This inter-regional collaboration is recommended to be expanded.

As mentioned, there are still considerable potentials for expansion in linkages among the countries of the region. The Western Indian Ocean Marine Science Association (WIOMSA) established in 1991 has the potential to become an important regional body for oceans and coastal affairs.

7. OTHER DONOR ACTIVITIES IN THE MARINE ENVIRONMENT

It is difficult to obtain accurate listings of all donor funded marine projects in this region. A variety of databases were examined (IDRIS, FIPIS, DAI CD-ROM) but none appeared to provide complete information. Therefore, the following comments should be weighed with this fact in mind. As can be seen, historically most donor support was in the area of marine capture fisheries. There has been a significant investment in this sector and this type of support had been increasing in recent years. However, the Mission believes that there has not been a sufficient disciplinary breath in the marine sector (particularly in terms of the recommendations of Agenda 21) and as well very limited support for research, including local capacity-building as the critical component of sustainable development. The Sida/ SAREC support is therefore filling an important niche in the development process.

There appears to be a significant opportunity to explore mechanisms for coordinating this donor support more effectively. This point will be expanded in the later discussion on networking. Sida/SAREC is recommended to take a leadership role in this effort and if possible to put in place appropriate networking around the WIOMSA association. Given the decreasing resources available from most donor agencies as well as the need for the development of a sustainable network, a multidonor-funded network makes sense for the future development of this program. More donor agencies seem to be interested in collaboration in recent years and there are specific proposals being developed to establish such a network.

8. LOOKING AHEAD

As outlined earlier in this report, the marine environment in most of East Africa is still in relatively good shape with only localized problems particularly in areas of high population density. However, these problem areas are signposts for the future. With a population increasing at a rate of 4-6% in the coastal region, these local environmental problems will expand and worsen unless specific policy and management programs are put in place soon. The Sida/SAREC programs of research and related capacity-building are now well positioned to play a major role in this effort.

The Mission noted that little planning has been done as yet as to what might be included in the Phase II proposal to Sida/SAREC (and other donors). While there was no specific inclusion of this issue in the Terms of Reference of the Mission, it is important that this planning starts as soon as possible. Largely this planning must come from the national institutions in the countries in the East African region, however, some proactive stimulation by Sida/SAREC and other interested donor agencies is suggested to kick start this process.

This early planning is necessary for two reasons. Firstly, if one thinks about the time sequence involved in this work. For instance, on average training to the Ph.D. level requires 5-6 years post graduate training; in addition most research requires at least 3-5 years to plan and carry out; then there is an 8-10 year further time lag between doing the research and then translating the results into some integrated local development program or management plan. Therefore this marine science program must anticipate the likely marine sector problems around the year 2025. Much of this planning has recently been done and is well summarized in the World Bank report, *Africa: A Framework for Integrated Coastal Zone Management*. The Mission was very impressed with the plan suggested in this report and a continued and expanded linkage with this program is strongly advocated.

Secondly, there is a need for an early initiation of the planning of the new phase as it will involve the project management approach (LFA), which requires an active participation of the stakeholders in the planning and formulation of the programs. It is realistic to allow for one year of the planning phase. It is proposed that this planning is initiated in mid 1996 to have the second phase ready when the current tentative allocations have elapsed in 1997.

8.1 The Future Programs

The current Sida/SAREC programs could be characterized as pioneers for establishing a substantive marine science research in East Africa. The programs were therefore by necessity flexible and adaptive to the special conditions in Mozambique and Tanzania. The current programs have, as been discussed above, been successful in establishing a research capacity in marine sciences in Mozambique and Tanzania, although the structures established are weak and not sustainable at present. Therefore, there is a need for further support from international donor agencies. Support that will hopefully assist in creating viable and sustainable institutions.

The second phase, will start from a much better position as some of the initial basic problems have been solved. However, some of the initial problems have not yet been fully eliminated, and new challenges have appeared that needs to be addressed in the second phase.

This Section will discuss some of the central issues that will affect the formulation of the second phase. Towards the end (8.3) the Mission is proposing an expansion of the existing

initiative of networking, that would address the problems and issues related to marine and coastal management in an ecological and inter-disciplinary manner, rather than approaching them from traditional and existing sectorial institutions.

8.1.1 Scientific contribution

Good science must continue to be the main focus of this next phase; scientific quality aimed at the international standard must be the goal of this support. However, there is a critical need to shift most resources to attack the more applied research problems. Research priority setting, therefore, must assume increasing importance both on a regional and national level. Serious resource conflicts are predicted to take place in the coastal zone in the coming decade and this research program must anticipate these conflicts and propose management solutions as soon as possible. Other studies have shown that there can be significant returns to well planned research (e.g. returns in excess of 40%). It is suggested that development of local institutions, that could supply answers to these problems will provide important dividends far in excess of the amounts of support provided.

8.1.2 Training

There is still a serious need to continue degree and short course training throughout most of the region. However, it is suggested to move towards a more planned approach for the latter, based on better definition of training needs related to research needs both nationally and on a regional basis. This planning of the training is only practical at an institutional level and it should be done with a view to develop sustainable research institutions.

As planned, most degree training can be done in this region at institutions such as the UEM, UDSM and Kenyan Marine and Fisheries Research Institute (KMFRI)[15]. Short term courses will likely be given in the region, as well often in association with other organizations but under the overall planning of the regional network. This approach will both build on the earlier Sida/SAREC funding and allow a more cost effective approach to training based on regional needs.

The initial trials of sending Mozambique students to study in South Africa should be continued and expanded. With the political opening up of this country, South Africa can now play an increasing role in the region as a full member of the network. A member with a relatively well developed research and training base that can be used to assist the other countries in the region.

There is now a need to establish programs related to research management, including training in project management, simple accounting, how to write a research proposal, and a scientific paper for publication in an international journal. Research management training especially in the development of skills in "grantsmanship" (how to obtain research grants) should be developed. Sida/SAREC should continue support for degree training with a continued push to do as much of this training in the country and/or region as possible. This will require some flexibility as the research problem set is becoming more complicated and requires training in more advanced techniques and particularly analytical procedures.

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[15] KMFRI does not offer courses, but avails its facilities to post-graduate students, from Kenyan universities, doing their work on coastal environments

8.1.3 Backstopping, research management, technical support

A flexible series of backstopping approaches under the network, is advocated to encourage more visiting senior scientists from more advanced scientific institutes who will likely be interested to participate in solving some of the management problems in this very interesting region. Additionally, young scientist exchanges have proven to be effective as younger scientists from developed and developing countries have a greater capacity to make these paradigm shifts, combined with the energy and interest to tackle new problem sets. Such innovation and exchanges need to be actively encouraged under this networking program.

More training in research management is needed by many of the project leaders and their staff. Such training should be established under the new revised training program for the network and this could be carried out as a short term course in the region.

The Coastal Management Center (CMC) in the Philippines is one institution that has been assisting the development of the Regional Program to date and this cooperation should be continued to take advantage to the maximum of the information and methodologies that are available from the Asian region.

It would be useful to discuss with ICLARM their possible backup support for this network in terms of new methodologies and information (particularly from the ICLARM programs in Asia).

If this report is to be implemented (all or in part), it is suggested that the Reference Group should be charged with the responsibility of reviewing this report and further working with the Evaluation mission (and/or others) to develop a program for implementation of the recommendations in this report.

8.1.4 Management of Swedish counterpart institutions and role of coordinators

Greater interaction and discussion among the Swedish counterpart institutions would assist each to gain information and new ideas on how to improve their collaboration in East Africa. This issue will be even more important in a Phase 2 if the proposed expanded network is developed. For instance, this will introduce greater heterogeneity in the types of institutions and the need for different forms of collaboration. In the expanded network advocated below, there will be a need for contact between the different counterpart institutions of each bilateral donor agency. This should be pushed by Sida/SAREC and the e-mail system could be used to enhance this communication leading to better management and avoidance of the old problem of "too many cooks spoiling the broth" syndrome.

Swedish coordinators (scientific and management) have an important role to play. In the future, scientific credibility and experience from program planning and management will be the important criteria to determine who are the appropriate persons to fill these positions.

8.1.5 Twinning Arrangements

Twinning involves the development of a long term partnership of a Swedish institution and an East African institution. The advantage lies in the long term partnership allowing a more detailed understanding of each other and therefore the provision of more relevant and often timely support. As the new network develops there should be a shift of more management and training programs to the member institutions in the Western Indian Ocean. However, there will still be a need for support from advanced scientific institutes in the industrialized

countries. Twinning is a useful option to allow involvement of Swedish (and other advanced institutions) on an as needed basis. That is, the research needs in themselves will be changing and involve mainly applied research with a small amount of pure or basic research. The latter will take place in some of the more advanced scientific institutes in this region.

8.1.6 Capacity-building and sustainability of the research and the institutions

It is imperative that the research program move in a more applied direction and start providing answers for some of the problems related to development of the marine sector. Visible and quality returns on the research investment to date are critical for future fund allocation. In addition, research needs to become more interdisciplinary in the coastal zone and this must include all stakeholders in this process.

For all three programs or a blend of them, negotiations with the national governments and the concerned research institutions are needed to establish clear criteria for the development of incentive packages and associated mechanisms that will lead to the development of sustainable research institutions. It is recommended that a more detailed examination of possible incentive mechanism be undertaken by Sida/SAREC including the offering of salary supplements, contract support (with the private sector for instance), special travel or other researcher incentives, etc. in line with SIDA procedures. Institution building should focus on the establishment of a critical mass of researchers in the broad disciplinary spectrum advocated above.

8.1.7 Awareness creation among public and decision makers

This will be an increasingly important issue both in terms of developing national and regional support for the ocean sector as well as leading up to what will be an increasingly important regional theme in the coming 5-10 years.

Continuation of support for the policy level "Arusha type" conferences (cf. Section 5) is highly recommended. These conferences offer an important mechanism to advise policy makers in advance of specific problems and to develop a common understanding on the need for new policies.

Continued support for public awareness programs such as the Handbook (cf. Section 2.5.1) is recommended and consideration should be given to other public awareness building ideas such as Oceans Day. Much of the world still suffers from an overly terrestrial orientation. Efforts to improve the understanding by the public of the importance of the oceans are crucial for the long term public support which is a necessary precondition to the sustainability of this ecosystem.

8.1.8 Development issues

The continuum between research and development must be examined as part of this planning. While the majority of the recommendations suggested here deal with research, there are clear needs to link this research with a strong implementation component at the local (subregional) level. This approach should be tied to an initial focus on "HOT SPOTS", most often found near the centers of increasing population such as in the Dar es Salaam and Maputo coastal areas.

The development divisions of Sida should be playing a closer partnership role with the research division of Sida in this work. Planned and existing Sida projects should be linked to the new research network. For instance the proposed initiative on the marine environment in the Kunduchi region of Tanzania should be linked with the Tanzanian research institutions. This linkage should include the involvement of IMS/UDSM research staff in the planning of the development program, definition of the related research agenda and the training of the needed new staff.

Other research programs could be developed into broader projects; e.g. expand on and forge stronger links with the local opportunities in aquaculture such as the rapidly expanding seaweed farming industry which has a strong involvement of women of formerly migrant groups. This industry has development potential in wider areas than where it is currently practiced.

The research should be used to seek out more opportunities to work with and establish baseline data for future sustainable development of this coast, such as prawn farming, oyster, mussel, finfish, etc. Links should be established with this emerging private sector to continue relevance of applied research and to establish credibility of local research group. The research groups could also acquire knowledge and skills in EIAs and conduct such studies for the private sector, as contract research to supplement income. Other topics might include environmental economics in which more realistic resource accounting principles are introduced into the system of national accounting.

8.1.9 Dissemination

This is a key component for the future program and deserves continued support from Sida/SAREC and other donors. It is hoped that Belgium (Flemish institution) will provide continued support[16] for parts of this work under the expanded networking plan. Continued support is recommended for mechanisms for translating research findings into policies and actions: journal articles, handbooks and other lay publications, national workshops, newsletters.

The next phase should consider support through WIOMSA to a Journal of Marine Science and an expanded WINDOWS newsletter. Both are important communication mechanisms and their use should be reviewed in conjunction with the new improved communications and e-mail links to RECOSCIX. RECOSCIX has made important contributions in assisting the national institutions to have e-mail connections for bibliographic databases in the region. Electronic networking should be used increasingly to improve communication/cooperation in the near future among national institutions and among donor agencies. For instance, BELLANET is prepared to work with RECOSCIX to involve donor agencies more fully in this process through mechanisms such as a marine science bulletin board system; this could be very useful in defining the details of the next round of project support. BELLANET has indicated that it is prepared to give a demonstration of this system now being used in other areas of environmental management.

[16] Currently the RECOSCIX is supported by the Belgium government.

8.1.10 Systems for monitoring and evaluation

As indicated above the planning of the new phase will involve LFA, which will automatically lay the base for monitoring and evaluation. Since the new phase is envisaged to be rather complex and expanded compared to the current programs, it is a need to systematically set up procedures for monitoring and evaluation. These procedures should also include budget lines in the programs.

The system for monitoring and evaluation should not be considered as a control mechanism, but rather a means to train the receiving research institutions in research management. The system also serves as a useful tool for Sida/SAREC to gain information on the performance of the programs.

8.2 *Opportunities for Donor and Executing Agency Collaboration*

The general plan for the expanded WIOMSA network is outlined below, where broader based donor agency participation is suggested. As a next step the countries of the region must begin to define their research needs. An initial workshop (perhaps a virtual one) could be tried using BELLANET, involving (as an initial list) Sida/SAREC, NORAD, IDRC, CIDA, DANIDA, ODA, World Bank, UNDP, IOC/UNESCO, FAO and IUCN. The objective would be to list present and planned projects in this sector and region, then to define possible areas of future support related to the research needs as outlined by the countries/institutions in the region. At present there does not seem to be an institutional mechanism that facilitates the definition of donor inputs for research for development on an eco-regional basis.

8.3 A Network of Networks - Super WIOMSA

There is a need to move the research framework onto a broader ecological and disciplinary basis. The present subdivision into the three Sida/SAREC programs (reviewed in this report) is an impediment to the development of the above suggested research framework. Recognizing the need of donors to have country programs, there should be a mechanism combining donor country support with ecological based approach. A rough outline of such a network of networks is sketched out below. Whether this network would be affiliated with WIOMSA (formally or informally) would obviously have to be discussed with and agreed to by WIOMSA.

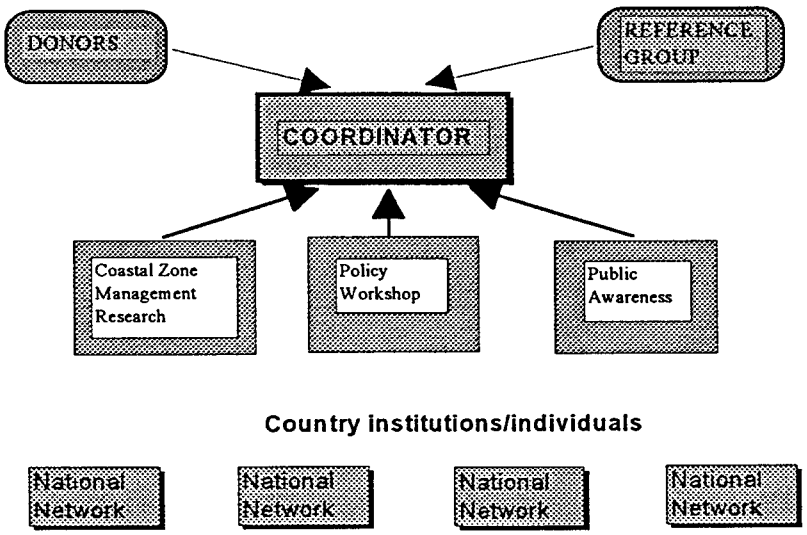
Objective: An established interdisciplinary network for improved understanding and management of the marine resource base in the Western Indian Ocean.

The focus should be on research for the management/development of the marine sector. Initially a focus on the coastal zone is the suggested main sub-objective with a concentration on the hot spots in the main areas of dense population. As a footnote, although the focus of this network is on research, this must include development as well. Research, particularly the more applied aspects, is seen as a part of a continuum through to development. This linkage is critical to achieving the ultimate objectives of sustainable development.

Institutional mechanism: Development of improved institutional mechanisms must be a priority for this plan. Sida/SAREC support should promote the usage of networking as a fundamental approach to this institutional problem. WIOMSA can be the main vehicle for support under an expanded networking format using the present WIOMSA structure as the initial building block. A possible expanded structure is given in Figure 4. Increasingly

SIDA/SAREC (and other donor) funding should flow through this expanded network to maximize the utilization of the different ecological systems and evolving institutional strengths that exist in the region. The present institutional system does not reflect the new UNCED Agenda 21 approach linking the different ecological systems that exist in the region (eco-regional approach). For instance, the ICZM (Integrated Coastal Zone Management) and LME (Large Marine Ecosystem) concepts can then be more easily incorporated into this system of management. The overall objective should be the promotion of sustainable development of the marine sector by linking research to development while involving the stakeholders, from policy level through to coastal resource users. Further, it is now possible to consider a Virtual Network using electronic communication in addition to present communication/dissemination mechanisms.

Figure 4: Tentative structure of the super network.



Affiliation: WIOMSA as a non-government body offers a number of advantages over traditional governmental and intergovernmental bodies. There are existing government bodies and these can be used where necessary. In general, new institutional mechanisms need to be tried both within countries and in the eco-region as a whole.

In addition to the present research institutions supported to date in Tanzania and Mozambique, exploratory missions should visit to assess the institutions in the other countries in the region, to discuss this concept and seek their interest in participation. Some of this information already exists and just needs updating in terms of recent relative capabilities and more specific regional needs.

Geographical coverage: Network country coverage should expand to include all countries in this ecological region, i.e. all mainland countries from Somalia in the north to South Africa in the south as well as the island states in the Western Indian Ocean. It is suggested that all of SADCC (South Africa Coordination Countries) be considered for inclusion.

Funding: Sida/SAREC cannot support this effort alone and an expanded network involving a broader cross-section of interested donors is advocated. Donors can be subdivided into

those focusing their support on research and those focusing on development. Within the latter there are bilateral and multilateral agencies whose mandates could be mutually complementary in support of the network objectives. At present bilateral donor agencies such as those from Sweden, Denmark, Norway, Canada, Belgium and the European Union plus multilateral agencies such as UNDP and the World Bank have been active in this sector. This group should be the starting point for discussion. Improved donor coordination has been accepted as an important concept in these times of declining resources. However, there seem to have been very few cases where these agencies were able to coordinate their inputs or for that matter to even join the same meeting. A network based on direct contacts through workshops both electronic and face to face (attached to regional workshops) could play an important role in this networking.

It is estimated that initial core funding of the order of USD 150,000 to 200,000 would be needed to support a coordinator and support staff. Related project funding might flow through this coordination mechanism (the preferred option) or through the previous bilateral and multilateral channels.

Structure: A network coordinator with modest supporting staff should be established at one of the national institutions. Preference should be given to nationals from the region for this position.

Duration: Continuous external monitoring and an evaluation should be built into this plan to decide the long term duration of this program. Consideration should be given to building in a sunset clause if there is agreed concern about the establishment of more bureaucratic layers in an expanding regional system.

In the long term, when the East African countries have evolved a basic research capacity WIOMSA might serve as a regional research council, organizing and supporting regional programs and thus providing a mechanism for larger scale cooperation in the management of coastal marine resources. One item that needs to be developed further in the region is a research peer-review mechanism and a regional networking approach would be ideal to do this. As a related development, this network could assist the less marine science developed countries in the region to benefit from the capabilities and knowledge of the more marine science advanced countries in the region. Sida/SAREC should specifically target their funding to proactively encourage a more broadly based support mechanism for this networking from a variety of donors. Specific regional priority setting workshops should be continued but coupled with presentations at other donor meetings to build understanding of the needs, opportunities and progress to date in this region.

8.3.1 National networking

Institutional coordination problems need correcting at the national level as well as the regional level. For instance in Tanzania, NEMC (National Environmental Management Council), University of Dar es Salaam, TAFIRI (Tanzanian Fisheries Research Institute), Department of Fisheries, need to more closely coordinate their programs.

Therefore, nationally each country (particularly for the larger countries or those with many institutions involved in the management of the marine sector) should develop a network linked to the regional network. Both in pursuit of the same objectives of sustainable development of the marine ecosystem.

Sida/SAREC support should continue to develop the marine science capacity-building but this support should increasingly move to Tanzanian institutions that will attack the more applied problems. At the same time UDSM/IMS should be developed as a regional research and training center for other less developed marine science institutions in the region.

Similarly in Mozambique, the Institute of Small-scale Fisheries (IDPPE), Ministry of Environment (MICOA), and UEM just to name three specific examples need better mechanisms for improving coordination.

9. CONCLUSIONS AND RECOMMENDATIONS

Conclusions concerning the individual programs have been given above in the respective Sections. Here we will draw some general conclusions related to all evaluated programs. Similarly particular recommendations to specific issues have been supplied in the text, while in this section a few salient recommendations are given for the next phase of the programs. These recommendations also include specific short term actions proposed to be taken by the Swedish side as well as the Mozambican and Tanzanian side.

9.1 Conclusions

There has been significant progress in scientific capacity-building in all three programs. This has been a major achievement and all involved should be congratulated for the efforts to date. It is recommended that in the future, more resources should be directed to the better use of this scientific capacity in the identification and then action on critical development problems. This will involve mechanisms to expand the program into associated levels of the research of the coastal development paradigm. For instance, greater involvement of stakeholders such as the coastal zone users needs to be developed particularly in the identification of the research agenda. Likewise, research results need to be translated into policy recommendations through linkages with managers and other government officials. The Arusha meeting has laid an important base for this type of linkage; this effort should be continued and expanded to all interested countries in the region.

One of the characteristics of the current programs, especially in their implementation was the flexibility and non-bureaucratic approach. It has been argued that this was achieved, partly as a result of unspecified objectives of the programs - a large degree of freedom was provided. Specified objectives would have limited the possibilities to adapted to the reality. It is the opinion of the Mission that in the case of the Sida/SAREC Marine Science Programs the approach chosen has been an advantage. It could serve as a model for initiating programs in similar fields and uncertain circumstances. The approach is suitable for "high risk projects". However, although in this case the programs have been successful, the approach could have lead to failures, had it not been for the dedicated personnel on the recipient side as well as in Sweden. Lack of specified objectives opens for ambiguity and hinders monitoring.

It is the view of the Mission that specified program's objectives, output, activities, etc., do not contradict with a flexible approach; objectives and activities can be changed and adapted to the realities encountered. The difference is that those responsible for the funding and management of the program would have possibilities to discuss and agree on the changes, and the new objectives, etc. are included in program documentation. Stated objectives, etc. facilitate meaningful monitoring and evaluation and could at an early stage identify poor performance and inefficiency. In order words an enhanced program management would be achieved, without a lack of flexibility. It is recommended that the above sketched approach would be used in the next phase of the programs

9.1.1 Closure versus continuation

The review Mission is unanimous in urging Sida/SAREC to continue its support of the programs in an expanded and modified form. Cessation of support now would be catastrophic

in terms of leaving these motivated and now trained research teams hanging without the needed research support to produce results for which they were trained. Termination of support would effectively destroy both the motivation and much of the fragile human capacity. In addition, the Sida/SAREC reputation for long term capacity-building would be sacrificed.

There is the evolving nucleus of the needed capacity to carry out marine science in East Africa. Before this program this was not the case at least in the target universities.

What is needed is a strong proactive move by SAREC to use its next phase of support as a catalyst to encourage expanded other donor support coupled with increasing national funding for marine science.

9.2 Recommendations

It is recommended:

1. To build sustainable marine science institutions: Most funding is needed for continued capacity-building in the national marine science institutions in the East African region. This manpower development should be coupled with an incentive system that will keep the trained staff in the institutions working full time on the research agenda.

2. To establish mechanisms for research priority setting: The research agenda will need to meet the needs of all stakeholders, who are involved in and dependent on the marine and coastal resources. It is recommended that a system be established that encourages the participation of all such groups both in the definition of the research agenda but also in the downstream dissemination and application aspects of this work. This will entail a more interdisciplinary approach that involves more social science research in parallel with the present greater emphasis on natural science studies.

3. To ensure scientific quality and international recognition: Good science is a prerequisite for efficient development. Therefore it is necessary to link recommendations 1 and 2 with a technical review and quality control mechanism using scientific publication in international peer-reviewed journals coupled with technical guidance and planning by a revised Reference Group. Most of the research should move into a more applied orientation initially focused on integrated coastal zone management.

4. To promote networking as a coordination mechanism aimed at breaking down the existing sectoral barriers both nationally and at the regional level. The networking could also be extended into twinning arrangement between Swedish and East African research institutions. The networking would further involve development of mechanisms for expanded funding and other forms of cooperation to encourage other donor participation under the networking format.

5. To establish systematic training in research management, to make the research institutions able to control their resources and eventually make them viable and sustainable.

9.3 Proposed Sida/SAREC Short-Term Actions

1. To continue support for a Phase 2 of marine science in Africa.

2. To start the planning of the next phase not later than mid 1996.

3. To examine options for linking the research programs supported to date by SAREC with existing and future development programs supported by other divisions of Sida.

4. Initiate a study to assess the alternative for IMS to re-locate to new and suitable premises. This study should take all alternatives into consideration and also review the division of labor between IMS and the Kunduchi Research Station.

9.4 Proposed Governments and Universities Short-Term Actions

1. Tanzania and Mozambique must fulfill their obligations from the various resolutions it has endorsed for the country to take a lead in the region on matters related to the ICZM.

2. UEM should look into the possibilities to decentralize the accounting and financial control of the Swedish funds to faculty or department level.

3. Tanzanian and Zanzibar government shall take actions to ensure suitable location of the IMS and rehabilitation of the Kunduchi Research Station.

4. UEM should approach the Sida through the Swedish embassy in Maputo for application of funding for environmental studies, from the special environmental funds.

Sida

Appendix 1.

Department for Research Cooperation, Sarec

Terms of Reference -
SAREC Marine Science; Bilateral Marine Science Program with, Tanzania, Mozambique and SAREC Marine Regional Program in East Africa

Background

Sida´s goals as a development cooperation agency are, with regard to research capacity building, to support developing countries to build research capacity and research facilities, to train their own researchers and to develop methodologies for planning and management of research.

Since first of July 1995 SAREC and SIDA have merged into a new organisation, the Swedish International Development Agency. Sida. SAREC is now the Department for Research Cooperation, Sarec. Sarec continues with the previous stock of research projects. The Sarec Marine Science Program is a joint name for several marine research activities sponsored by SAREC.

Marine bilateral program with Mozambique

In 1985 a marine bilateral program was launched in Mozambique. The target was Faculty of Biology, Eduardo Mondlane University, and the aim was to strengthen the research capacity in marine science. The program identified a group of young students and they started on a M Sc training. Seven years later four of the M Sc students started on a Ph.D training. During the years of the program many small infrastructure achievements have been set up both at the laboratory in Maputo and at the Biological Station in Inhaca. An important step in the program was the initiative to set up a training of technicians. Other achievements have been the restoration of Inhaca Marine Biological Station. During 1991 the second SAREC Marine Regional Meeting was held on Inhaca. Since then, the marine bilateral program in Mozambique is closely working together with the WIOMSA and SAREC Regional Marine Science Program. The Swedish counterpart for this bilateral cooperation has been Kristineberg Marine Biological Station.

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Marine bilateral program with Tanzania

In 1989 SAREC launched a marine bilateral program with Tanzania. The collaboration institutions were Institute of Marine Science in Zanzibar, IMS, (belonging to UDSM) and The Botany institute at UDSM. In Sweden the counterparts were Department of Zoology, Stockholm University and Department of Physical Botany, Uppsala University. The small scale research program started off with a slow increase in infrastructures for the two Tanzanian institutions. Both institutions had field areas on Zanzibar.

Marine regional program in East Africa

With the 1989 meeting of marine scientists in Dar-es-Salaam, SAREC launched its regional marine science program for East Africa. For further information on the regional marine science program please see the "*SAREC REGIONAL MARINE SCIENCE PROGRAM*" booklet from 1995.

The Evaluation

The Evaluation - capacity measures

The evaluation team should focus on quantitative as well as qualitative measures.

The quantitative measures should count number of degrees delivered in the program overall, including all levels of degrees. The number of publications is also of importance to quantify, and the amount of infrastructures built.

The qualitative measures should focus on types of publication, infrastructures in relevance to the marine science capabilities in the region.

Other relevant measures

A suggestion to the evaluators is to produce a list of *pros and cons* of the three programs. One issue of high relevance for all SAREC programs is to build awareness of the importance of science in developing countries. How do these programs reflect this awareness building? The specific term "coastal area awareness" - has it been covered in the programs?

The link between institutions and the university body is an important issue for SAREC. Has it been of any specific role in this program?

How does the linkage between the institutions and the university work?

It would be of interest if the evaluators could speculate about the future of this program in the context of the new Sida - is there any "natural piggyback links" that could be established with other departments at Sida. The similar question could also be raised for collaboration with other donors, i.e. could we do someting together with IDRC/CIDA, NORAD or DANIDA? Today there is a specific link with Unesco/IOC in the program. This collaboration with an inter-governmental body - is it an example to be recommended and used by other donors?

The report should ideally present five recommendations indicating the future paths for the program.

Miscellaneous

The report should be written in English and not comprise more than 50 pages. The draft report should be delivered to Sida´s research department, Sarec, not later than January 30, 1996, and the final version should be delivered to Sarec 10 days after received the commented draft version. The final version might be presented in a seminar form by the evaluators.

Appendix 2: Persons interviewed

Mozambique

University of Eduardo Mondlane
Mr. Salomao Bandeira, Head of Botany Section, Department of Biology
Ms. Filomena Barbosa, Lecturer, Botany Section, Department of Biology
Mrs. Celia Dinis, former Dean of Finance
Mr. Lourenco Dique, Public Relation Officer
Mr. Domingos Gove, Head of Inhaca Marine Biological Research Station
Mr. Mário Getimane, First Assistant, Scientific Directorate
Mr. Adriano Macia, Head of Department, Department of Biology
Dr. Isidro Manuel (Dauane), Dean, Faculty of Science
Mr. Joel Manjate, Director of Finance
Dr. Celeste Mondego, Former Dean of Faculty of Biology, and Former Accountant
Mr. Felisberto Pagula, Department of Chemistry
Dr. Orlando Quilambo, Former Dean, Faculty of Science

Sida/SAREC Students
Mr. Adriano Macia
Ms. Aidate Mussagy
Ms. Filomena Barbosa
Mr. Domingos Gove
Mr. Almeida Guissamulo
Mr. Salomao Bandeira

Swedish Embassy
Ms. Ann Stödberg, Counselor, Development Cooperation

Tanzania

IMS
Dr. Julius Francis, Acting Director
Mr. Salim Mzee Mohammed, Section of Chemical and Environmental Science
Dr. Mathew Richmond, Coordinator for the production of the handbook
Mr. Yohanna Shagaude, Section of Physical and Applied Marine Science
Mr. Jode Shunula, Section of Living Resources and Technology

IMS Students
Mr. William Kisinza
Mr. Juma W. Kangwe
Mr. Nzali Lewis
Mr. Salim Mzee Mohammed
Mr. Shigalla Mahongo
Mr. Mohamed S. Mohamgo
Mr. Yohanna Shagaude

University of Dar es Salaam
Prof. Matthew L. Luhanga, Vice Chancellor
Mr. Magehema, Chief Technician, Botany Department

Dr. F.S.S. Magingo, Senior Lecturer, Botany Department
Dr. Yunus D. Mgaya, Lecturer, Department of Zoology and Marine Biology
Prof. A.M. Nikundiwe, Dean, Faculty of Science
Prof. A. Semesi, Head, Botany Department
Dr. Felister Urasa, Head, Department of Zoology and Marine Biology
Dr. Simeon Mesaki, Department of Sociology

Sweden

Ms. Barbro Carlsson, Sida
Dr. Anders Granlund, Sida
Mr. Jan-Olof Lundberg, Sida

Dr. Matz Björk, Department of Physiological Botany, Uppsala University
Prof. Lars Hernroth, Royal Swedish Academy of Sciences
Dr. Ron Johnston, Department of Zoology, Stockholm University
Prof. Olof Lindén, Department of Zoology Stockholm University

Reference Group

Magnus Ngoile, Head, Marine and Coastal Management, IUCN
Chua Thia Eng, Director, CMC
Per Wramner, Director General, National Board of Fisheries
Gunnar Kullenberg, Executive Secretary of IOC

IOC

Mr. Peter Pissierssens, Technical Assistant Secretary
Mr. Salvatore Arico, Associate Expert

Synopsis

Resolution on Integrated Coastal Zone Management in East Africa Signed in Arusha, Tanzania

More than half of the world's population lives within 60 km of the shoreline, and trends in population growth indicate that this figure could rise to 75% by the year 2020. The lives and reasonable aspirations for economic advancement of these coastal residents are inextricably linked to the productivity of coastal resources. The shallow tropical coastal areas have traditionally supported highly productive ecosystems from which fish and other aquatic resources have been harvested. In addition to their natural protective and defence functions against coastal erosion and flooding these natural systems provide valuable services in terms of recreation, coastal tourism, marine transportation. Unfor-tunately, in many parts of the world, most of the natural resources are overexploited and fragile coastal systems are severely degraded by unregulated human activities. As a result, the productivity and usefulness of these coastal areas have been dramatically diminished and the prospects for sustainable development are greatly jeopardized.

The coastal areas of East Africa and the Western Indian Ocean contain some of the worlds richest ecosystems including extensive coral reefs, lagoons, estuaries and mangrove forests. These ecosystems support a wide diversity of plants and animals, and the economic benefits derived from the coastal environments are essential for large sections of the population in the countries of the region. However, in East Africa and the islands of the Western Indian Ocean, as in the rest of the tropics, the pressures from growing populations and expanding economic development are increasingly threatening the functional integrity of the natural coastal systems. Evidence of large-scale destruction of valuable coastal forests including mangrove wetlands, overexploitation of lagoon fisheries, indiscriminate use of coral resources and inadequate economic development planning and management have all contributed to declining productivity, pollution, and degradation of environmental quality. These activities have resulted in negative impacts on the livelihoods of the coastal inhabitants and stand to deprive future generations of the potential benefits from these natural endowments. There are a number of reasons for this seri-

Resolution on Integrated Coastal Zone Management in Eastern Africa including the Island States

RECOGNISING, that coastal areas contain a number of critical terrestrial and aquatic habitats, as well as diverse and valuable resources; and that coastal ecosystems are intimately linked with social economic and cultural development processes;

WHEREAS, many major cities of the Eastern African region are located in coastal areas; and these areas include significant populations and are focal points of human activity; and the economies of the region are extremely dependent on the continuing productivity of activities, such as fishing, forestry, agriculture and mining, which are based on natural resources; and important food and cash crops are grown in coastal areas; and fish and other aquatic resources provide food, materials, employment and income for many coastal people; and the region's coastal areas also provide many other economic opportunities, especially tourism and shipping;

WHEREAS, experience in other regions of the world shows that the nature or intensity of coastal activities can give rise to natural resource and environmental management concerns and lead to serious deleterious impacts on the productivity of coastal ecosystems, adversely affecting the food security, health, nutrition and economic welfare of coastal populations;

WHEREAS, coastal management problems in the Eastern African region are serious, and there are some localised areas where there are acute problems, such as oil pollution;

WHEREAS, experiences in Integrated Coastal Zone Management (ICZM) in other regions have shown that prevention is better than cure, as well as the importance of balanced use of coastal resources;

WHEREAS, economic and social development of coastal areas and protecting the resource base and the environment must be mutually supportive if development is to be sustainable; and the purpose of integrated management is to allow multisectoral development to progress with the fewest unintended setbacks and the least possible imposition of long-run social costs;

WHEREAS, coastal planning efforts cannot be divorced from terrestrial management and must be integrated with national economic and physical planning;

WHEREAS, poor planning and management in coastal areas can increase the loss associated with natural processes such as coastal erosion and catastrophic events such as major storms, floods and oil spills;

WHEREAS, there is a lack of capacity in the region to deal effectively with complex coastal management issues;

WHEREAS, political leaders can contribute to meeting this commitment in the region; and government decisionmakers and the private sector, including NGO's, can play a crucial role through their support of management plan development and implementation, and their encouragement of coastal communities to act cohesively to enhance prospects for sustainable development of coastal areas; and community participation is essential and should actively involve all stakeholders, particularly women and resource poor groups;

WHEREAS, international organisation and donor agencies can likewise contribute meaningfully to the course of development of coastal areas by ensuring that all sectoral projects funded are congruent with multisectoral development plans;

WHEREAS, it is important to increase public awareness regarding the importance of coastal resources, the dependence of continued prospects for economic development in coastal areas and the proper management of coastal resources;

WHEREAS, coastal resource will continue to be essential for the economic welfare of future generations in the Eastern African region; and there is a growing awareness on the part of governments of the region regarding the need for sustainable development of coastal areas;

WHEREAS, in recognition of the need for effective coastal management strategies, the countries of the Eastern African region have affirmed their concurrence with the mandate in UNCED's Agenda 21 for new approaches to development and management of coastal areas that are more integrative, precautionary and anticipatory;

THEREFORE, we the Heads of Delegations participating in the Policy Conference on Integrated Coastal Zone Management in Eastern Africa including the Island States hereby resolve and recommend that the countries of the Eastern African region give emphasis to the sustainable development and integrated management of coastal areas for the primary benefit of coastal communities by:

establishing policies that promote and enhance integrated planning and management of coastal areas by integrating the coastal zone into national economic and physical planning;

ous situation. In general, there is a lack of knowledge and understanding of the coastal resources and their interaction with terrestrial and oceanic processes. This lack of information and awareness, together with ineffective coastal planning and management further aggravate the situation.

At the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, 1992, the protection of coastal environments to ensure sustainable use of natural resources was at the top of the agenda for action. Under Agenda 21, coastal states should "commit themselves to integrated management and sustainable development of coastal areas and the marine environment under their national jurisdiction." UNCED further pointed out the importance of coastal states developing national policies and management capabilities for integrating the development and management of multisectoral activities in coastal and marine areas.

With the aim to discuss problems and solutions to sustainable development of coastal areas of East Africa and the Western Indian Ocean, the Ministry of Tourism, Natural Resources and Environment of Tanzania, the University of Dar es Salaam and Swedish Agency for Research Cooperation with Developing Countries (SAREC) organized a Workshop and a Policy Conference on *Integrated Coastal Zone Management* in Arusha, Tanzania, 22–23 April 1993. The Workshop and Policy Conference were co-sponsored by the United Nations Food and Agricultural Organization (FAO), Intergovernmental Oceanographic Commission (IOC), Swedish International Development Authority (SIDA), United Nations Environment Program (UNEP) and the World Bank. At the Workshop, which was attended by about 75 senior officials and experts from the region and other parts of the world, the present environmental problems in the coastal areas of the region was discussed and the participants agreed on a number of technical recommendations. At the Policy Conference, which was opened by the President of the United Republic of Tanzania, His Excellency Mr. Ali Hassan Mwinyi, ministers of environment/natural resources from Madagascar, Mauritius, Mozambique, Seychelles and Tanzania discussed the recommendations from the preceding Workshop. The Swedish Government was represented by the Minister of Physical Planning, The Hon. Ms Görel Thurdin. At the end of the day, the Ministers from the region signed a Resolution on Integrated Coastal Zone Management in East Africa and Island States. The Resolution which was later also signed by Kenya is given in full in the Box.

As a follow-up to the Recommendations from the Workshop and the Resolution adopted by the Policy Conference, a number of actions, projects and proposals are presently being prepared or implemented by all the agencies involved in organizing the meetings in Arusha. One example is the recent launching by SAREC of a regional program to support the development of science in the region. The major aims of this program, which is initially planned to run for a period of 6 years, will be the development of science and capacity building of relevance to Integrated Coastal Zone Management.

Olof Lindén
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Coordinator, SAREC Marine Science Program
Dept of Zoology, Stockholm University
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developing and implementing ICZM programmes which address environmental concerns, particularly resource over exploitation, environmental degradation and loss of biodiversity, and emphasize action at the local level;

promoting effective sectoral implementation of ICZM programmes through creating mechanisms and means for cooperation of and coordination among sectoral agencies, and among regional, national and local agencies;

clarifying the jurisdictional mandates of agencies and governmental units (geographical, sectoral and trans-sectoral) governing the use of coastal resources and assessing and clarifying all legislation (formal and customary) relating to access to coastal resources in particular property rights, occupancy patterns, and user rights in coastal areas;

promoting further links between marine and social sciences and the decision making process;

strengthening management capabilities of relevant agencies, particularly at the local level, for effective management of the overall environment, especially coastal areas;

implementing and rigorously enforcing effective legislative instruments and supporting incentives to reduce resource use conflicts as well as to prevent and control environmental degradation in coastal areas;

investing in public education and awareness programmes to create a broader and stronger constituency for proper management of coastal areas;

promoting approaches and strategies such as alternative livelihood programs and economic diversification to reduce pressure on coastal resources;

promoting the involvement of all stakeholders in the development and implementation of ICZM programmes particularly the involvement of local communities including women and resource poor groups;

providing appropriate incentives and guidelines for the private sector to develop environmental friendly economic activities;

promoting bilateral and multilateral training relationships between countries of the Eastern African region, and between these countries and other countries with more highly developed coastal zone management capability;

supporting the building of local capacity, *inter alia*, through establishment of centres of excellence for ICZM training in the region, such as Mbegani Fisheries Training Centre;

encouraging the preparation and implementation of contingency plans for handling oil pollution disasters;

establishing and strengthening other appropriate institutions, such as the proposed Marine and Coastal Biodiversity Centre in Seychelles; and;

giving consideration to the special problems faced by small Island States;

WE also recommend that scientists should:

adopt a multidisciplinary research approach involving ecological, economic and other social sciences to holistically address management problems in coastal areas; and provide information, including documentation on indigenous knowledge relevant to coastal development and management, particularly in providing a diagnostic profile of the coastal areas; resource valuation and environmental accounting; identification and analysis of resource use conflicts and their resolutions; policy and management options as well as investment opportunities.

WE recognise the importance of the Nairobi Convention on the Protection, Management and Development of the Coastal and Marine Environment in the Eastern African Region and related protocols for the regional follow-up of this resolution; and encourage Governments, which have not done so, to decide upon their ratification or accession in the shortest possible time, as well as other conventions relevant to coastal zone management, in particular the International Convention on Pollution of the Sea from Ships.

WE agree that a meeting at a ministerial level be held within three years as a follow-up to this policy conference, and invite the Government of the Republic of the Seychelles to consider hosting such a meeting, provided financial resources from external sources are available.

WE recognise the role of UNEP in coordinating the Eastern African Action Plan, within the framework of the Nairobi Convention, and the role of other international organisations in the promotion of ICZM; further, considering the importance of this Policy Conference and the need for follow-up, invite the Government of the United Republic of Tanzania to serve as coordinator for this purpose.

SIGNED April 23, 1993, on behalf of the Governments of: Republic of Madagascar (Mon. Mr. Etsifosaine, Minister of Water and Forests), Republic of Mauritius (Hon. Mr. Cuttaree, Minister of Housing, Lands, Town & Country Planning), Democratic Republic of Mozambique (Hon. Mr. Kachamila, Minister of Mineral Resources), Republic of Seychelles (Hon. Ms. Danielle de St. Jorre, Minister for the Environment, Economic Planning and External Relations), and United Republic of Tanzania (Hon. Mr. Juma Omar, Minister for Tourism, Natural Resources and Environment). In the beginning of May Hon. Mr. Sambu, Minister of Natural Resources signed the Resolution on behalf of the Government of the Republic of Kenya.

Sida Evaluations - 1995/96

95/1 Educação Ambiental em Moçambique. Kajsa Pehrsson
Department for Democracy and Social Development

95/2 Agitators, Incubators, Advisers - What Roles for the EPUs? Joel Samoff
Department for Research Cooperation

95/3 Swedish African Museum Programme (SAMP). Leo Kenny, Beata Kasale
Department for Democracy and Social Development

95/4 Evaluation of the Establishing of the Bank of Namibia 1990-1995. Jon A. Solheim, Peter Winai
Department for Democracy and Social Development

96/1 The Beira-Gothenburg Twinning Programme. Arne Heileman, Lennart Peck
The report is also available in Portuguese
Department for Democracy and Social Development

96/2 Debt Management. (Kenya) Kari Nars
Department for Democracy and Social Development

96/3 Telecommunications - A Swedish Contribution to Development. Lars Rylander, Ulf Rundin et al
Department for Infrastructure and Economic Cooperation

96/4 Biotechnology Project: Applied Biocatalysis. Karl Schügerl
Department for Research Cooperation

96/5 Democratic Development and Human Rights in Ethiopia. Christian Åhlund
Department for East and West Africa

96/6 Estruturação do Sistema Nacional de Gestão de Recursos Humanos. Júlio Nabais, Eva-Marie Skogsberg, Louise Helling
Department for Democracy and Social Development

96/7 Avaliação do Apoio Sueco ao Sector da Educação na Guiné Bissau 1992-1996. Marcella Ballara, Sinesio Bacchetto, Ahmed Dawelbeit, Julieta M Barbosa, Börje Wallberg
Department for Democracy and Social Development

96/8 Konvertering av rysk militärindustri. Maria Lindqvist, Göran Reitberger, Börje Svensson
Department for Central and Eastern Europe

96/9 Building Research Capacity in Ethiopia. E W Thulstrup, M Fekadu, A Negewo
Department for Research Cooperation

96/10 Rural village water supply programme - Botswana. Jan Valdelin, David Browne, Elsie Alexander, Kristina Boman, Marie Grönvall, Imelda Molokomme, Gunnar Settergren
Department for Natural Resources and the Environment

96/11 UNICEF's programme for water and sanitation in central America - Facing new challenges and opportunities. Jan Valdelin, Charlotta Adelstål, Ron Sawyer, Rosa Núnes, Xiomara del Torres, Daniel Gubler
Department for Natural Resources and the Environment

96/12 Cooperative Environment Programme - Asian Institute of Technology/Sida, 1993-1996. Thomas Malmqvist, Börje Wallberg
Department for Democracy and Social Development

96/13 Forest Sector Development Programme - Lithuania-Sweden. Mårten Bendz
Department for Central and Eastern Europe

96/14 Twinning Progammes With Local Authorities in Poland, Estonia, Latvia and Lithuania.
Håkan Falk, Börje Wallberg
Department for Central and Eastern Europe

96/15 Swedish Support to the Forestry Sector in Latvia. Kurt Boström
Department for Central and Eastern Europe

96/16 Swedish Support to Botswana Railways. Brian Green, Peter Law
Department for Infrastructure and Economic Cooperation

96/17 Cooperation between the Swedish County Administration Boards and the Baltic Countries. Lennart C G Almqvist
Department for Central and Eastern Europe

96/18 Swedish - Malaysian Research Cooperation on Tropical Rain Forest Management. T C Whitmore
Department for Research Cooperation, SAREC

96/19 Sida/SAREC Supported Collaborative Programme for Biomedical Research Training in Central America. Alberto Nieto
Department for Research Cooperation, SAREC

96/20 The Swedish Fisheries Programme in Guinea Bissau, 1977-1995. Tom Alberts, Christer Alexanderson
Department for Natural Resources and the Environment

96/21 The Electricity Sector in Mozambique, Support to the Sector By Norway and Sweden. Bo Andreasson, Steinar Grongstad, Vidkunn Hveding, Ralph Kårhammar
Department for Infrastructure and Economic Cooperation

96/22 Svenskt stöd till Vänortssamarbete med Polen, Estland, Lettland och Littauen. Håkan Falk, Börje Wallberg
Department for Central and Eastern Europe

96/23 Water Supply System in Dodota - Ethiopia. Bror Olsson, Judith Narrowe, Negatu Asfaw, Eneye Tefera, Amsalu Negussie
Department for Natural Resources and the Environment

96/24 Cadastral and Mapping Support to the Land Reform Programme in Estonia. Ian Brook
Department for Central and Eastern Europe

96/25 National Soil and Water Conservation Programme - Kenya. Mary Tiffen, Raymond Purcell, Francis Gichuki, Charles Gachene, John Gatheru
Department for Natural Resources and the Environment

96/26 Soil and Water Conservation Research Project at Kari, Muguga - Kenya. Kamugisha, JR, Semu, E
Department for Natural Resources and the Environment

96/27 Sida Support to the Education Sector in Ethiopia 1992-1995. Jan Valdelin, Michael Wort, Ingrid Christensson, Gudrun Cederblad
Department for Democracy and Social Development

96/28 Strategic Business Alliances in Costa Rica. Mats Helander
Department for Infrastructure and Economic Cooperation

96/29 Support to the Land Reform in Lithuania. Ian Brook, Christer Ragnar
Department for Central and Eastern Europe

96/30 Support to the Land Reform in Latvia. Ian Brook, Christer Ragnar
Department for Central and Eastern Europe

96/31 Support to the Road Sector in Estonia. Anders Markstedt
Department for Central and Eastern Europe

96/32 Support to the Road Sector in Latvia. Anders Markstedt
Department for Central and Eastern Europe

96/33 Support to the Road Sector in Lithuania. Anders Markstedt
Department for Central and Eastern Europe

96/34 Support to the Maritime Sector in Latvia. Nils Bruzelius
Department for Central and Eastern Europe

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