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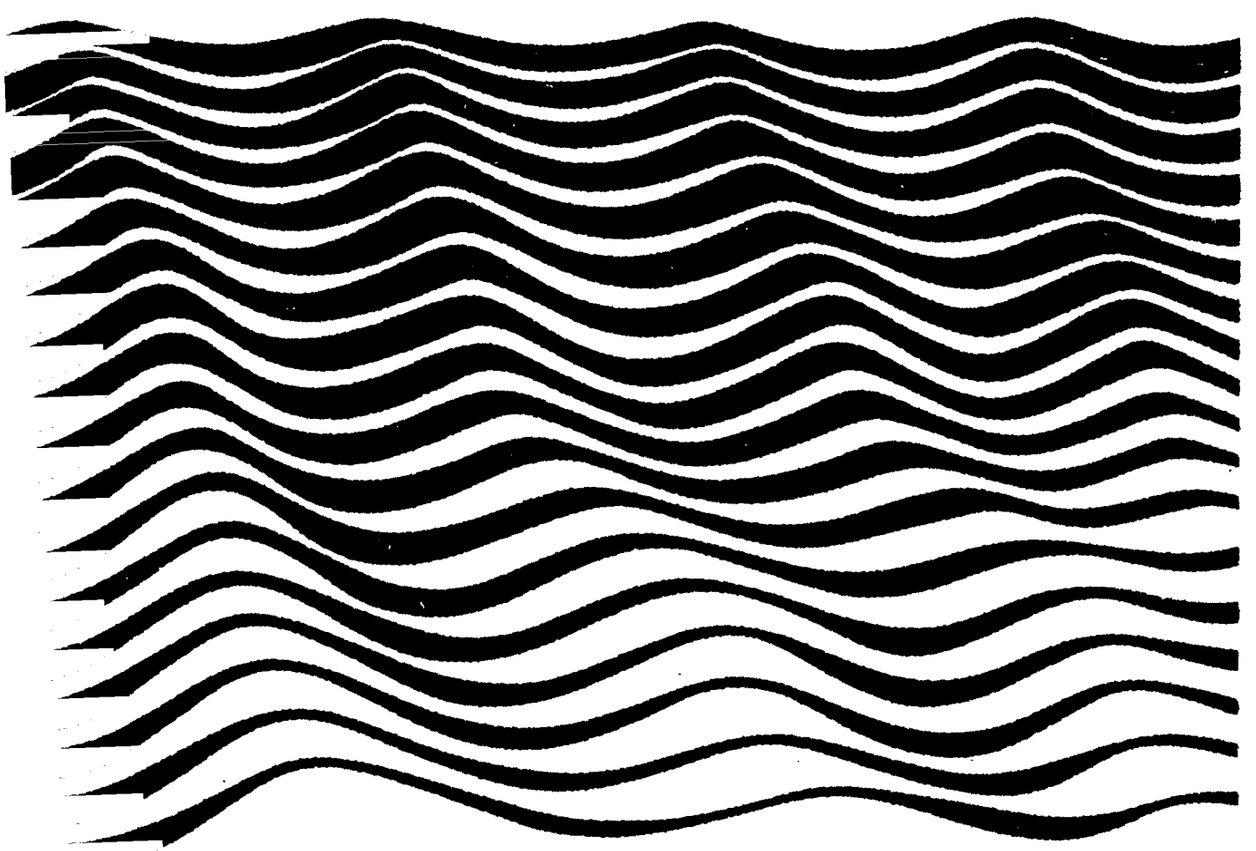
Development of marine science and technology in Africa

Working Group of Experts
sponsored by ECA and Unesco
Addis Ababa, 5-9 May 1980



Unesco, 1980

UNESCO REPORTS IN MARINE SCIENCE

No.		Year
1	Marine ecosystem modelling in the Eastern Mediterranean *English only*	1977
2	Marine ecosystem modelling in the Mediterranean *English only*	1977
3	Benthic ecology and sedimentation of the south Atlantic continental platform *Available in English and Spanish*	1979
4	Syllabus for training marine technicians *Available in Arabic, English, French, Russian and Spanish*	1979
5	Marine science syllabus for secondary schools *Available in Arabic, English, French, Russian and Spanish*	1979
6	Organization of marine biological reference collections in the Mediterranean Arab countries *Available in Arabic, English and French*	1979
7	Coastal ecosystems of the southern Mediterranean: lagoons, deltas and salt marshes *Available in Arabic, English and French*	1979
8	The mangrove ecosystem: human uses and management implications *English only*	1979
9	Scientific aspects and human impact on the mangrove environment *Available in English and Spanish*	1980

Unesco reports
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Development of marine science and technology in Africa

Working Group of Experts sponsored by
The United Nations Economic Commission for Africa (ECA)
and
United Nations, Educational, Scientific and Cultural Organization (Unesco)

Unesco, 1980

PREFACE

The Unesco Reports in Marine Science are issued by the Division of Marine Sciences of Unesco. This series comprises papers designed to meet the needs of particular programmes and to assess the situation of projects in preparation. It also deals with joint activities undertaken by the Division with the Intergovernmental Oceanographic Commission, particularly in the field of theoretical and practical training.

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CONTENTS

INTRODUCTION

In October 1979, a project document entitled "Development of Marine Science and Technology in Africa" (RAF/78/024/A01/51) was approved by the United Nations Development Programme and the two executing agencies, the United Nations Economic Commission for Africa and the United Nations Educational, Scientific and Cultural Organization (UNESCO). The document describes the preparatory phase of the project, which has a duration of fourteen months and is funded by UNDP ($282,700).

The project became the first project to be jointly implemented by ECA and Unesco as executing agencies under the "Arrangement between the Director General of the United Nations Educational, Scientific and Cultural Organization, and the Executive Secretary of the Economic Commission for Africa" which was signed on 10 May 1979.

The following report gives the proceedings of a meeting of a Working Group of Experts on the Development of Marine Sciences and Technology in Africa, which was jointly convened by ECA and Unesco, in Addis Ababa, 5-9 May 1980. The meeting is one of the initial activities envisaged within the framework of the above-mentioned project. An excerpt from the project document is included in Annex 3 of this report.

REPORT OF THE MEETING OF THE WORKING GROUP OF EXPERTS ON THE DEVELOPMENT OF MARINE SCIENCE AND TECHNOLOGY IN AFRICA

Addis Ababa, 5 - 9 May 1980

A. ATTENDANCE AND ORGANIZATION OF WORK

Opening of the Meeting

1. The Meeting of the Working Group of Experts on the Development of Marine Science and Technology in Africa was held in Addis Ababa, Ethiopia, 5-9 May 1980. The Meeting was opened jointly by Dr. E. Lartey, Acting Chief, Natural Resources Division, Economic Commission for Africa, and Dr. Selim Morcos, Division of Marine Sciences, Unesco, Paris. Both Dr. Lartey and Dr. Morcos gave opening addresses on behal of the Executive Secretary of ECA and the Director-General of Unesco respectively.

Attendance

2. The Meeting was attended by experts designated by ECA and Unesco from Brazil, Egypt, Ivory Coast, Kenya, Madagascar, Morocco, Philippines, Senegal and Sierra Leone. Representatives of ECA, Unesco, FAO, IOC, UNEP, UNDP, WHO and the ECA Secretariat were also present (see Annex 1).

Election of officers

3. On the opening day of the Meeting, the following were unanimously elected : Professor D.E.B. Chaytor (Sierra Leone) as Chairman, Dr. N. Odero (Kenya) as Vice-Chairman, with Dr. E.D. Gomez (Philippines) and Mr. S.G. Zabi (Ivory Coast) as Rapporteurs. A Drafting Committee was also chosen, composed of the Project Co-ordinator, Dr. A. Msangi and the two Rapporteurs.

B. AGENDA

4. On 5 May, the meeting unanimously adopted the agenda as presented in Annex '.

C. ACCOUNT OF THE PROCEEDINGS

5. The Acting Chief of the Natural Resources Division of the Economic Commission for Africa welcomed all the participants on behalf of the Executive Secretary of the Commission (see Annex 6). He expressed the appreciation of the various co-operating United Nations Organizations for the positive response of the participants to the invitation. Special gratitude was expressed to UNDP for their financial assistance to the project.

6. Acknowledging the importance of science and technology in the development of nations, he noted that the African continent has been at a disadvantage in this respect. However, the African nations have recently adopted a plan of action for economic development which gives first priority to the field of food and agriculture, including fisheries. Up to now, deficiencies in national machineries for research and development, in trained manpower, and even in science policy formulation put Africa at a rather low level of utilization of science and technology in development. This situation is also true in the field of marine science and technology.

7. Limited resources on land have led more and more to the exploitation of the oceans, a development which has brought about the recognition of extended marine jurisdiction. The implications of this new maritime regime for the African states are vast and complex and the countries are, by and large, unprepared. There is thus an urgent need to develop marine science and technology capabilities throughout the continent.

8. The speaker referred to the terms of reference of the mission, a diagnostic exercise that attempts to look at the whole problem concerning marine science and technology in Africa in its totality and to suggest comprehensive remedial measures which would be equally all-embracing in geographical and subject coverage. The report and recommendations resulting from the missions will form the main substance for a blueprint for the development of concrete measures to strengthen the capability of African coastal states in the exploitation of their marine resources.

9. The Unesco representative conveyed the greetings of the Director-General of Unesco to the participants (see Annex 7).

10. He noted that during the last decade there has been a slow but steady increase in efforts to develop the various aspects of marine science, a development which can be correlated with the global awareness of the importance of the oceans. The awareness concentrates on two themes : the marine environment and marine resources.

11. The acceptance of the concept of the Exclusive Economic Zone (EEZ) will allow individual nations to exploit resources up to a distance of 200 miles offshore. Scientific research and fishery exploitation will also be affected by the outcome of the Third United Nations Conference on the Law of the Sea (UNCLOS). In general, African coastal states will benefit from the new regime.

12. The speaker went on to say that efforts are being made to enhance the capability of African states to make better use of the seas although presently there is a lack of trained manpower. The present project aims at answering the question of how best to develop marine science and technology to meet the requirements of the African Member States. This project in marine science is the first operational project within the framework of an arrangement between Unesco and the ECA, signed on 10 May 1979, and consequently this meeting is the first substantive and operational meeting to be convened jointly by the ECA and Unesco.

Introduction of the Working Paper by the Project Co-ordinator (Agenda item 4)

13. The Working Paper on the State of Marine Science and Technology Development in African Coastal States was introduced by the Project Co-ordinator, Dr. A.S. Msangi. He explained that the Working Paper gives an overview of the state of marine science and technology development in African coastal states. The Preamble, describing the Project Document, is found in Annex 3. The Introduction gives the Project rationale and execution. The main body of the paper consists of four sections covering:

(1) general activities related to marine science and technology development carried out under the auspices of the United Nations organizations and other agencies;

(2) regional activities related to marine science and technology in East Africa and West Africa;

(3) training and research in marine science and fisheries, and

(4) the state of marine science and technology in East and West African coastal states.

A questionnaire on information required from research and training institutions and a second one on information required from Government Ministries, Departments and Institutions on marine science and technology are attached as annexes.

Comments on the Working Paper

14. One of the factors affecting the development of marine science and technology in Africa is the policy of African Governments concerning the emoluments or salary structures of indigenous scientists and technologists because it is this policy that would determine whether or not a country would be able to retain its trained manpower, i.e., it is a determining factor on whether or not there would be a brain drain.

15. The work of compiling the Working Paper was a complex exercise and the paper should serve as a guideline, the information to be completed during the country missions. There is no need to discuss here the document in detail. The main inputs of this meeting should be to the questionnaires, to make sure that through them we obtain correct information concerning the actual state of marine science and technology development in African countries.

16. The paper has, in some parts, tended to present a pessimistic view of the situation, implying that very little was being done to develop marine science and technology, although some countries have undertaken this development with considerable success. It is not completely true to say that African marine resources were underdeveloped or not being fully utilized. There were instances, e.g., in fisheries, where there was almost full exploitation with little room for improvement. Sometimes traditional methods of fishing are

more efficient than industrial fishing, depending on the species being exploited. In countries like Senegal, Ghana and Nigeria, the fishing industry is well developed. It is true that there are some African countries, e.g. Namibia, where the marine resources are being exploited and sometimes over-exploited by foreign fishing fleets. Other countries, like Mauritania, derive considerable revenue from licenced foreign fishing vessels.

17. The training of scientific manpower is very important but it should be accompanied by effective ways of absorbing and utilizing the scientists in relevant country services. Otherwise these scientists will leave their countries for better employment opportunities elsewhere. In some cases, the shortage of trained manpower and infrastructural facilities could be remedied through co-operation with other countires, including developing countries.

18. It was noted that the Working Paper did not adequately cover IMCO activities.

19. The UNEP Governing Council recently passed a resolution establishing an East African Action Plan similar to the West African Action Plan. As a result of that resolution, the whole of the African region was now covered by UNEP Action Plans. Pollution is a result of human activities; UNEP is interested in the control of pollution, in conjuntion with the promotion of development activities in harmony with the environment.

20. Some of the shortcomings of the Working Paper were due to the fact that some activities in marine science and technology were not known and were unco-ordinated, even within the same country.

21. A documentation centre for marine science and technology should be established at the ECA. There is a lack of co-ordination within and between African countries. Lack of trained manpower increased the likelihood of resources draining from African to other countries.

22. The Working Paper is not claimed to be complete and in some parts it needs up-dating and correcting. It was meant to start the ball rolling. The importance of science and technology for development is emphasized. The Working Paper considers all aspects of marine science and technology, and in such areas as the exploitation of marine mineral resources, there is very little development in African coastal states. So the paper in this respect is correct.

Information and guidelines for country missions (Agenda item 5)

(a) Programme and activities of the missions

23. The Terms of Reference of the field missions were introduced by the representatives of the ECA and Unesco secretariats and, after some discussions and modifications, were adopted (see Annex 4).

(b) Questionnaires

24. The questionnaires on 'Information required from Research and Training Institutions in Marine Science and Technology' and on 'Information Required from Government Ministries, Departments and Institutions on Marine Science and Technology' were discussed and some modifications and additions were made (see Annex 5).

(c) Mission reports

25. The contents and format of the final report and of the mission reports were discussed and, after some modification, adopted during the meeting (see Annex 4).

Other business (Agenda item 6)

26. The IOC representative introduced a proposal that the consultant missions to West African countries should also ascertain the reactions of these countries to the possibility of incorporating a Workshop on the Establishment of a Marine Science Association of West Africa into the Workshop scheduled for this project in January 1981. The meeting felt it was not competent to make a decision on this.

27. The representative of the Unesco Secretariat gave a detailed briefing to the consultants on the logistics of the field missions.

ANNEX 1

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ANNEX 2

AGENDA

1. Opening - Representatives of ECA and Unesco
2. Election of Chairman and Rapporteur
3. Adoption of the Agenda
4. Working Paper - introduction by Project Co-ordinator
5. Information and guidelines on country missions
   (a) Programme and activities of the missions
   (b) Questionnaire
   (c) Mission report
6. Any other business
7. Adoption of the Report
8. Closure of the meeting

ANNEX 3

THE STATE OF MARINE SCIENCE AND TECHNOLOGY DEVELOPMENT IN AFRICAN COASTAL STATES

PREAMBLE

During the past three years, both ECA and Unesco have made an increased effort directed towards strengthening the co-operation between the two Organizations with the formulation and implementation of development programmes for Africa. As an outcome of this effort, a document entitled "Arrangement between the Director-General of the United Nations Educational, Scientific and Cultural Organization and the Executive Secretary of the Economic Commission for Africa" was signed on 10 May 1979.

As stated in this document:

"The broad objectives of co-operation and of joint programme activities between Unesco and the Commission are the following:

(a) to provide an operational basis for conceiving, formulating, programming and initiating joint action on specific projects within areas of common concern and regional priorities;

(b) to initiate studies and provide background information on specific problem areas in science and technology such as would provide African States with guidelines for the formulation of policies and programmes for the development of science and technology education and research relating to socio-economic progress;

(c) periodically to review and appraise the efficiency, relevance and effectiveness of science and technology as tools for national development of Member States in the African region;

(d) to promote national and multi-national action in programmes in intra-African co-operation in the development and utilization of facilities for scientific and technological education, training and research".

Furthermore, it was agreed that priority would be given to joint action in respect of programme activities and projects coming within the scope of this agreement in a specific number of fields, including marine science and technology.

Within the framework of this Arrangement and as a result of extensive consultation between ECA and Unesco, a project document on the Development of Marine Science and Technology in Africa was prepared as the first

project for joint implementation by ECA and Unesco as Executing Agencies. The document describes the preparatory phase of the project, which has a duration of fourteen months and is funded by UNDP (US$ 282,700). The following is an Excerpt from the Project document, which was approved by ECA, Unesco and UNDP in October 1979[1/]:

"A. Development Objective

1. To enhance the capability of existing marine science institutions through the development of a regional and sub-regional programme of research and training in marine science and technology, with due regard being paid to the development of marine environmental services, shipping, coastal area development and the protection of the marine environment.

2. To develop the ability of African countries in understanding and making use of thier marine resources through regional and sub-regional co-operation, based on active exchange in scientific and policy matters, and a continuous mechanism of contacts among scientists and decision-makers in African member states.

B. Immediate Objectives

1. An up-to-date inventory of human resources, infrastructure and facilities, as well as national policies, on-going and planned programmes in marine science and technology available in East and West Africa, as a result of field missions to the following countries:
East : Sudan, Djibouti, Ethiopia, Somalia, Kenya, Tanzania, Mozambique, Madagascar and the Indian Ocean Islands.
West : Morocco, Mauritania, Senegal, the Gambia, Sierra Leone, Guinea Bissau, Guinea, Gabon, Equatorial Guinea, Cape Verde, Sao Tome and Principe, Liberia, Ivory Coast, Ghana, Togo, Benin, Nigeria, Cameroon, Congo, Zaire, Angola and Namibia*.

2. A definition of the areas of priority of immediate concern to African countries in the fields of marine science and technology and marine environment as well as a comprehensive plan for the determination of a basis for a regional programme in this field, as a result of a marine science and technology workshop followed by an Intergovernmental Meeting.

C. Special Considerations

1. Advances in technology have enabled man to extract minerals from the sea - especially the hydrocarbons; but a consensus has gradually been reached that the mineral resources of the deep sea

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1/ This section gives a general account of the Project as outlined in the Project Document "RAF/78/024/A/01/51 Development of Marine Science and Technology in Africa".

* North African countries have not been included in this project because they are already engaged in a complexity of programmes, e.g. the UNEP Mediterranean Action Plan. Programmes in execution in the Mediterranean will be taken into account during the other stages of execution of this project.

bed are a common heritage of mankind and that a portion of the resources derived from their exploitation should be turned over to an international fund to be used to help the poorer countries. This led the General Assembly to pass Resolution 2749 which declared that resources of the deep sea were " the common heritage of mankind" and that their exploitation should be undertaken only pursuant to an international regime to be agreed upon.

2. During the last decade, the international community has been trying to approach the exploitation of the resources of the sea rationally and efforts have been made to negotiate a new Law of the Sea Convention; but it has proved extremely difficult to reach an agreement particularly because there is a widening gap in marine science and technology between the developed and the developing countries. An entirely new system must be created which would include both technical capacibilities and relevant infrastructural services.

3. In addition to achieving the long term objective of enabling African countries to develop scientific and technological capabilities for the exploration and exploitation of marine resources as well as for non-resources oriented activities such as shipping, coastal area development and the protection of the marine environment, the project is also expected to:

(a) assist in the process towards complementarity in cooperation and development;

(b) promote technical co-operation between Africa and the other developing regions, which is one of the global economic goals established by the governing authorities of the United Nations Development Programme.

D. Background and Justification

1. The long coast line of Africa, and its oceanic and inshore water areas are generally characterized by high productivity and rich fisheries, when compared to the less productive areas in the semi-closed seas. Upwelling which enhances high productivity occurs along the West coast of Africa and is also associated with the circulation along the East coast of Africa.

2. The coastal zone and the near-shore environment in the region have many potential resources such as fish-stocks, possibilities of mariculture, heavy minerals and evaporites, tourism, etc. The marine resources of Africa are greatly under-developed, and not fully exploited. Many are exploited by foreign fleets with marginal benefits to the countries concerned. The growing numbers of population, and the threat of drought in certain regions are among the reasons for the increasing interest of many African States in developing their capability in understanding and exploiting their seas.

Under such conditions, it is necessary that the main resources be exploited by man to the optimum level, and that such exploitation provide maximum benefit to the people of Africa. In order to attain such an objective, it is essential to develop and create a scientific manpower of well-trained specialists in Africa. This will require very strong educational training and research programmes in marine science and technology to strengthen and generate the indigenous scientific and technological manpower that could provide the marine administrators, and decision makers with the basic data and scientific conclusions necessary for the best management and development of the marine environment.

3. Past and present activities to develop marine science and technology in Africa include the following:

(a) Co-operative Investigations of the Northern Part of the Eastern Central Atlantic (CINECA) of the Intergovernmental Oceanographic Commission (IOC) of Unesco ; the CINECA programme was organized by ICES, with the assistance of IOC and FAO (CECAF).

(b) Scientific Workshop to initiate planning for a co-operative investigation in the North and Central Western Indian Ocean (CINCWIO) of IOC/Unesco, Nairobi, March-April 1976; and the first meeting of the countries of the CINCWIO region, Nairobi, March 1979.

(c) The international conference on Marine Science Resources Development for Eastern Africa held in Dar-es-Salaam in 1974, recommended the establishment of a Marine Resources Development Centre in Tanzania that would form a knowledge base for conservation and rational utilization of both human and material resources for national and regional needs.

(d) Two subregional meetings on Training, Education and Mutual Assistance (TEMA) of IOC were held in Casablanca in 1974 for West African countries and in Cairo in 1975 for Arab countries and Iran.

(e) UNEP sponsored action plan for the protection and development of the marine environment and coastal areas of the West African Region.

(f) FAO (FI) : Fisheries department has also been carrying out activities to strengthen the scientific capabilities of African countries and promote intra-regional co-operation through :

(i) FAO fishery bodies (GFCM for the Mediterranean, CECAF for West Africa and IOFC for the Indian Ocean) and their subsidiary bodies.

(ii) two inter-regional projects of FAO in the Indian Ocean and off West Africa which are very active in assessing present means and constraints, organizing regional training centres in all fields of all levels of fishery science and

supporting regional or sub-regional activities such as workshops or seminars.

(g) Organizations such as ICSEAF (for the South East Atlantic) and ICCAT (tunas) are particularly active in organizing training seminars and offer an efficient structure for regional collaboration in the field of fishery sciences.

4. General Assembly Resolution 3201 (S-VI) and 3202 (S-VI) of 1974 contained the Declaration and Programme of Action on the Establishment of a New International Economic Order, while General Assembly Resolution 3281 (XXIX) of 1974 contained the Charter of Economic Rights and Duties of States which called on developing countries to develop and mobilize adequate scientific, technical, managerial and other trained manpower resources in order to sustain the required capability for the exercise of sovereignty over their natural resources, for the control of their economic activities and for the transfer of science and technology.

5. On the national level, many African countries have become aware of the vital role that can be played by marine science and technology in their national economy. Marine sciences were introduced to a number of the Universities either as regular courses or postgraduate research. Few universities offer degrees in marine scineces. Among the Universities which became active in marine sciences or are planning to do so are the Universities of Dar-es-Salaam, Nairobi, Addis Ababa, Mogadiscio, Khartoum, Dakar, Fourah Bay College (Sierra Leone), University of Ghana (Legon) and Lagos University. Independent governmental research institutes in marine sciences and in fisheries are found in Zanzibar and Mombasa, Port Sudan, Nosy Bé, Nouadhibou, Dakar, Abidjan and Lagos. The established fishery and oceanographic laboratories of Pointe Noire (Congo), Tema (Ghana) and Casablanca (Morocco) are also worthy of mention.

6. As a general feature, these institutions keep some scientific contacts with overseas institutions while their contacts among themselves are considrably weak. A stronger effort is required to activate scientific exchange among these institutions as well as with the advanced institutions outside Africa.

7. Although the Law of the Sea Conference has not yet completed its work, it is now evident that when a Convention is finally arrived at, it will most likely include the establishment of:

(a) An International Sea-Bed Authority which would be charged with research, exploration and exploitation of the sea-bed resources beyond the limits of national jurisdiction;

(b) A 12-mile territorial sea;

(c) A 200-mile Exclusive Economic Zone wherein the coastal state will have jurisdiction over all resources - living and non-living.

8. This project will enable African States to handle new decisions emanating from the Law of the Sea Conference, and, especially, to establish working relations with the proposed International Sea Bed Authority. Moreover, the proposed project in its second phase will be able to produce scientists and research workers who will conduct research and enable African countries to undertake the exploitation of their resources in the Exclusive Economic Zone.

E. Output

During the preparatory assistance phase, the output will be:

(a) An assessment of the existing situation and potential (national policies, research and development activities and institutions, traditional technology, current or proposed projects, training and professional facilities, etc.);

(b) A compilation of documentation on research related to marine science and technology and the marine environment;

(c) A comprehensive plan to determine a regional programme of action on the development of Marine Science and Technology in Africa and aimed at the solution of problems connected with rapid urbanization, port development, industrialization and the preservation of the marine environment and the fishing industry.

F. Activities

Description	Location	Time
1. A project co-ordinator will be appointed to assist in implementing the various stages of the Preparatory Phase of the project and eventually participate in one or two of the missions planned.	Addis Ababa	January 1980
2. A Working Group of African marine specialists as well as a few from other developing regions will be convened jointly by ECA and Unesco with the participation of UNEP, WMO and FAO to define the terms of reference, including the format of the mission report of the missions, as outlined in the immediate objective of this project document	Addis Ababa	5 - 9 May 1980
3. A joint ECA/Unesco mission composed of three teams of African marine specialists assisted by ECA and Unesco	Countries listed under immediate objectives	May-August 1980

Description	Location	Time
staff or consultants will make an up-to-date inventory of human resources, facilities available, and conduct discussions with government officials and marine specialists in African countries interested in marine science and submit a report		
4. A Marine Science and Technology Workshiop jointly convened by ECA/ Unesco with the participation of all interested UN bodies and other agencies will discuss the outcome of the mission and advise on areas of priority and propose a detailed work plan for a second phase project to be executed jointly by ECA/Unesco	Addis Ababa	January 1981
5. An intergovernmental meeting to which all interested UN bodies and other agencies will be invited will be requested to endorse the second phase project and its workplan and discuss further steps required to develop the interest of the African nations in exploration and rational exploitation of marine resources	Addis Ababa	February 1981

G. Inputs

(a) Government participation

Governments will provide the international experts on mission in their respective countries with local transport and other facilities which may further the success of the mission. They are also requested to provide their local experts with any facilities needed to enable their countries to be effectively represented at the meetings provided for in the work plan of the project.

(b) UNDP

The total cost of the activities mentioned in section F above is estimated at US$ 282,700 during the preparatory assistance period of 14 months (January 1980 - February 1981), which will be met by UNDP.

(c) Unesco

Unesco will assist ECA in guiding and supervising the missions and will participate in the implementation of the project.

(d) UNEP

As associated agency, UNEP's co-operation on the project will include :

(i) participation in the meetings envisaged by the project;

(ii) putting at the project's disposal all information and documentation prepared for the WAAP, as soon as it can be released, in addition to documentation already communicated to ECA;

(iii) assistance if required in the selection of consultants;

(iv) UNEP will continue to invite UNDP, ECA and other organizations participating in the project to UNEP-sponsored meetings relevant to the development and implementation of WAAP.

(e) ECA

ECA assumes responsibility for the compilation of the background documentation for the project. ECA will provide office space and secretariat support for the experts.

H. Resources required

(a) a Project Co-ordinator

(b) a meeting of the Working Group of Marine Specialists

(c) three missions comprising three consultants each to visit :

(i) East African countries
(ii) West African countries (French speaking)
(iii) West African countries (English speaking)

(d) a Workshop on Marine Science and Technology

(e) an intergovernmental meeting."

ANNEX 4

TERMS OF REFERENCE FOR THE FIELD MISSIONS

PROJECT RAF/78/024

I. Introduction

1. The state of the general economy of the world has in recent years forced nations (especially industrialized ones) to look more and more to the sea as an important source of food for the rapidly increasing human population, and a source of different kinds of raw materials and energy for the maintenance and development of industries.

2. Because of her low level of scientific and technological application in marine sciences, Africa has hardly participated in the above exercise. The marine resources of the continent are therefore greatly underdeveloped and not fully exploited. But the growing population, the threat of drought in certain areas, the scarcities of non-renewable resources, energy shortages, insufficiency of protein from land-based animal and plant sources, are among the reasons for the increasing interest of many African states in developing their capability in understanding and exploiting their seas.

3. Another compelling reason is the consideration by the Third United Nations Conference on the Law of the Sea (UNCLOS) of the following:

(a) The right of coastal states to establish a 200 mile wide "Exclusive Economic Zone" around their coasts;

(b) The establishment of the resources of sea and the sea bed beyond the "Exclusive Economic Zone" as the "common heritage of mankind" to be used mainly to assist development in developing countries.

4. The first action has brought vast living and non-living resources under the jurisdiction, management control and ownership of coastal states. The management, control and rational exploitation and utilization of such resources calls for a highly complex legal, administrative, scientific and technological machinery.

5. African coastal states should therefore take urgent steps to set up and develop such machinery, otherwise the vast resources are likely to remain only on paper as a dream and will in all probability, mysteriously find their way towards the further enrichment of foreign countries.

6. The exploitation of the "common heritage of mankind" under the second arrangement will only be meaningful to African countries if they can within

reasonable time develop the necessary scientific and technological capabilities to enable them to participate on an equal footing, as far as possible, with developed countries in the exploration and exploitation of sea and sea-bed resources.

II. Objectives of the project*

7. The development objectives of the project therefore are:

(a) To enhance the capability of existing marine science institutions through the development of a regional and subregional programme of research and training in marine science and technology, with due regard being paid to the development of marine environmental services, shipping, coastal area development and the protection of the marine environment.

(b) To develop the ability of African countries in understanding, and making use of their marine resources through regional and subregional co-operation, based on active exchange in scientific and policy matters, and a continuous mechanism of contacts among scientists and decision-makers in African Member States.

(c) To assist in the process towards complementarity in co-operation and development.

(d) To promote technical co-operation between African and the other developing regions, which is one of the global economic goals established by the governing authorities of the United Nations Development Programme.

8. The immediate objectives of the project are:

(a) An up-to-date inventory of human resources, infrastructure and facilities, as well as national policies, on-going and planned programmes in marine science and technology available in East and West Africa, as a result of field missions to the following countries:

East : Sudan, Djibouti, Ethiopia, Somalia, Kenya, Tanzania, Mozambique, Madagascar and the Indian Ocean Islands. West : Morocco, Mauritania, Senegal, the Gambia, Sierra Leone, Guinea Bissau, Guinea, Gabon, Equatorial Guinea, Cap Verde, Sao Tomé and Principe, Liberia, Ivory Coast, Ghana, Togo, Benin, Nigeria, Cameroon, Congo, Zaire, Angola and Namibia.

(b) A definition of the areas of priority of immediate concern to African countries in the fields of marine science and technology and marine environment as well as a comprehensive plan for the determination of a basis for a regional programme, in this field, as a result of a marine science and technology workshop, followed by an Intergovernmental Meeting.

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* Extract from the Project Document - RAF/78/024

III. Tasks to be performed by the mission

9. (a) To study and analyse, in a comprehensive manner, the state of affairs (in terms of human resources, infrastructure and facilities, national policies, on-going and planned programme and activities) obtaining in African coastal states in regard to marine science and technology development.

(b) To examine existing institutions in this field, the adequacy of their orientation and of their linkages to the productive sectors and their relationship to training, manpower development programmes and marine science and technology education with a view to establishing modalities for remedial measures that are aimed at an overall improvement of the situation to enable them to better serve the marine science and technology needs of the African region.

(c) To formulate, in the light of the above and of national and regional objectives, proposals for a coherent, self-reliant approach to the problem of building the marine science and technological capability of Africa and to outline specific responses to problems identified in various sectors and set out in detail the role, functions, linkages and organizational structure of machinery necessary for their comprehensive solution.

(d) To identify priority areas for action and suggest an outline for a short-term and long-term programme of action for Africa in this field.

(e) To present its action-oriented recommendations, which will be compiled by the Project Co-ordinator, to a Workshop of Experts in marine science and technology in the form of a comprehensive report covering the following areas:

10. CONTENTS AND FORMAT OF FINAL REPORT

PREFACE

ACKNOWLEDGEMENTS

I. SUMMARY OF RECOMMENDATIONS

A. Action at the national level
B. Action at the regional level
C. Action at the international level

II. INTRODUCTION

Background to the mission
The mission
Organization of the mission
Composition of the mission
Organization of mission activities in the countries

III. AFRICAN EXPERIENCE

The "status quo" in countries as seen by the consultants

IV. MAJOR ISSUES AND OBSERVATIONS (including discussion of mission findings)

V. RECOMMENDATIONS

A. Action at the national level
B. Action at the regional level
C. Action at the international level

ANNEXES

INSTITUTIONS VISITED BY THE MISSION

REFERENCES

- First name and name of all authors
- Full title of the publication
- Full name of the journal or its abbreviation as in the World List of Periodicals
- Volume and fascicule
- Year
- First and last page.

II. CONTENTS AND FORMAT OF MISSION REPORT

PREFACE

ACKNOWLEDGEMENTS

I. SUMMARY OF RECOMMENDATIONS

A. Action at the national level
B. Action at the regional level
C. Action at the international level

II. INTRODUCTION

Background to the mission
Organization of mission activities in the country

III. AFRICAN EXPERIENCE

The "status quo" in countries as seen by the consultants

IV. MAJOR ISSUE AND OBSERVATIONS (including discussion of mission findings)

V. RECOMMENDATIONS

A. Action at the national level
B. Action at the regional level
C. Action at the international level

ANNEXES

I. LIST OF CONTACTS (Agencies, Officials, Inter. Orgzs, etc.)

II. QUESTIONNAIRE No. 1 (Consultant comments at the back)

III. QUESTIONNAIRE No. 2 (Consultant comments at the back)

REFERENCES

- First name and name of all authors
- Full title of the publication
- Full name of the journal or its abbreviation as in the World List of Periodicals
- Volume and fascicule
- Year
- First and last page.

IV. Modalities for the operation of the mission

12. The mission should see and hold discussions with personnel who utilize and plan the development of marine resources and the training of personnel in this field.

13. In this regard, the mission should consult with relevant national institutions and organizations such as :

(a) Relevant ministries responsible for Economic and Development Planning, Agriculture, Natural Resources, Higher Education, Scientific Research, Industry, Education (or Manpower Development), marine sciences and the marine environment.

(b) Institutions engaged in research, development and training activities in marine science and technology, such as universities, national research centres, polytechnics, semi-professional training programmes, industrial training schemes.

(c) Public sector institutions engaged in productive activities in marine science and technology such as fishing corporations, boat yards, workshops manufacturing fishing gear.

(d) Indigenous and foreign marine science and technology enterprises in the private sector.

(e) International agencies, including the UNDP, involved in the field, and

(f) Such other institutions and individuals as may assist them.

V. Composition of the mission

14. The mission will consist primarily of:

the Project Co-ordinator
10 outside consultants.

15. The mission will be divided into teams, each with a team leader to be designated by ECA/Unesco. The Co-ordinator will participate in the work of as many teams as possible. Each team will cover an average of four countries. The team leader will return to ECA to compile the report.

16. The participants will convene at ECA Headquarters in Addis Ababa on 5 May 1980 a Working Group Meeting which will brief them, and define the terms of reference of the mission, including the format of the mission report.

17. The teams are composed as follows:

Team	Names	Countries to be visited	Duration Dates (Provisional)
TEAM A:	Prof. Y. Halim Mr. A. Samba	Ivory Coast, Senegal, Morocco	11 May to 1 June 3 weeks
TEAM B:	Prof. E. Saaidi Mr. A. Samba	Mauritania, Guinea, Togo and Benin	17 June to 8 July 3 weeks
TEAM C:	Dr. A. Ralison Prof. E. Saaidi	Djibouti, Madagascar, Comoro, Mauritius, Seychelles	11 May to 8 June 4 weeks
TEAM D:	Prof. E. Saaidi Mr. S. Zabi	Cameroon, Gabon, Congo and Zaire	13 July to 9 August 4 weeks
TEAM E:	Prof. C. Sankaran-kutty Mr. S. Zabi	Mozambique, Angola, Equatorial Guinea, Guinea Bissau, Cape Verde	10 May to 21 June 6 weeks
TEAM F:	Prof. D.E. Chaytor Mr. J. Adejettey	Gambia, Sierra Leone, Liberia, Ghana, Nigeria	11 May to 10 June 4 weeks
TEAM G:	Dr. E. Gomez Mr. N. Odero	Sudan, Somalia, Kenya and Tanzania	10 May to 4 June 4 weeks

ANNEX 5

DEVELOPMENT OF MARINE SCIENCE AND TECHNOLOGY

IN AFRICA

Questionnaire 1

Information required from research and training institutions

in marine science and technology

1. Name of institution :

2. Full postal address of institution (including POB, telephone and telex numbers and telegram abbreviation):

3. Name and title of Institution's Executive Officer (Director, Head, Chairman, etc):

4. Type of institution (Governmental, independent, university, industrial or other):

5. Type and scope of research activities (oriented or unrestricted research in physical, chemical, geological or biological oceanography):

6. Brief history of institution :

7. Aims and objectives of the institutions:

8. Extent to which the research activities of the institution are related to the country's needs in marine science and technology development:

9. Organizational structure of institution (division into departments, research units, services etc) :

10. Research activities accomplished in the last three years:

11. Major current research, and its scientific leaders:

12. Research programmes for the next five years :

13. Mechanisms for dissemination of research results to users if any:

14. Linkages between the Institution and government Departments/Divisions dealing with marine resources development :

15. Mechanisms for co-ordination and co-operation between the institutions and other institutions carrying out related activities, e.g., research institutes and university departments:

16. 1. Co-operative programmes with other institutions within and outside the country, and international organizations:

2. Desirable regional co-operative programmes:

17. Provision for visiting scientists (laboratory space and living accomodation, fees charged) and experience in 'on-the-job training':

18. Scientific personnel (national and expatriate) of institution (full-time and part-time staff members) by name, academic degree (Ph.D., Doctorat d'Etat, M. Sc., etc.) and speciality including their administrative and co-ordinating responsibilities:

19. Supporting staff (technical, administrative and other):

20. Present laboratory space in m^2 (type, number and area of each in m^2) and planned expansion:

21. Ships currently owned, shared or used by the institution (name, length, hull construction, GRT, hp; speed, size of the crew, laboratory space, operating range, cruising range in days, number of berths, special facilities such as winches, stabilized current, permanent scientific equipment on board, number of days at sea for the past two years etc):

22. Present capital equipment (type and description, age and state) at the research centre (only items that cost more than $500),servicing facilities within the country:

23. Aquarium open to the public maintained by the institution (number of tanks, total volume, average number of specimens exhibited, specialities) and available experimental aquaria:

24. Library maintained by the institution : number of volumes (books) and periodicals (journals):

25. Journal or other periodical publication issued by the institution (title, language used, number of issues per year, last issued volume, available on an exchange or purchase basis):

26. Lectures at university by staff of the institution (undergraduate or graduate level, title of the course):

27. Instructional programmes at the institution (type of courses, undergraduate postgraduate, diploma) :

28. Facilities for student courses (laboratories and their equipment, number of students that can be accepted):

29. Places available for external students :

30. List of publications of the institution relevant to marine sciences:

31. If it is a training institution :

(i) type of training given : (e.g., a certificate or diploma course in oceanography, fishery biology, fish technology, navigation, boat building, etc., or a first degree or postgraduate course in marine biology, chemical, physical or biological oceanography, marine geology, marine engineering, marine meteorology, etc) :

(ii) Duration of the different types of training :

(iii) Employment opportunities of the trainees after qualification:

32. Major constraints facing the institution :

33. Measures being taken or planned for overcoming these constraints:

34. Assistance received from the United Nations system (e.g. Unesco, FAO, UNEP, UNDP, etc):

35. Assistance received from sources other than the UN system:

36. Annual budget (for three years) :

37. Marine Museum :

38. Important species available by group, cultivated or kept for experiments:

ANNEX 5

DEVELOPMENT OF MARINE SCIENCE AND TECHNOLOGY

IN AFRICA

Questionnaire 2

Information required from Government Ministries, Departments and Institutions on marine science and technology in African coastal states

1. Name of country:

2. Area :

3. Length of coastline :

4. Population (indicate year):

5. Ministry/Department responsible for marine resources development:

6. Title and address of Head of the agency responsible for the activities in 5 above :

7. Departments/Divisions dealing with marine resources development activities:

Name of Department/ Division	Address	Main activity	Title of Executive Head

8. Co-ordination and linkage mechanisms between the above Departments/ Divisions and relevant sectors of the economy, e.g. training and research institutions in marine science and technology in the country:

9. National activities in marine science and technology:

9.1. Ongoing activities in :

1. Fisheries and other living resources:

2. Oceanography (specify):

3. Conservation and protection of the marine environment :

4. Pollution :

5. Mineral exploration and exploitation (include sand, gravel and other aggregates) :

6. Boat building and marine engineering:

7. Oil exploitation and exploration :

8. Harbour development :

9. Coastal area development :

10. Tourism development :

11. Cartography and hydrography :

12. Remote sensing :

9.2. Planned activities :

1. Fisheries and other living resources :

2. Oceanography (specify):

3. Conservation and protection of the marine environment :

4. Pollution :

5. Mineral exploration and exploitation (include sand, gravel and other aggregates):

6. Boat building and marine engineering :

7. Oil exploration and exploitation :

8. Harbour development :

9. Coastal area development :

10. Tourism development :

9.3. Facilities for training of professional personnel in:

1. Fishery biology :

2. Biological oceanography :

3. Chemical Oceanography :

4. Physical oceanography :

5. Marine geology :

6. Marine mineralogy :

7. Marine engineering :

8. Navigation :

9. Fish technology (including fishing, fish processing and preservation, fish marketing and economics, gear technology) :

9.4. Need for personnel in (specify number of years) :

	Annual Production Capacity	Annual Requirement
1. Fishery biology :		
2. Biological oceanography :		
3. Chemical oceanography :		
4. Physical oceanography :		
5. Marine geology :		
6. Marine mineralogy :		
7. Marine engineering :		
8. Navigation :		

	Annual Production Capacity	Annual Requirements
9. Fish technology (including fishing, fish processing and preservation, fish marketing and economics, gear technology):		

10. Ministry responsible for external relations and co-operation in matters concerning marine science and technology development :

11. Co-operation with other countries in marine science and technology (including activities within the UN system):

1. Bilateral co-operation :

2. Sub-regional co-operation :

3. Regional co-operation :

4. International co-operation :

12. 1. Extent and use of the Exclusive Economic Zone :

2. Mechanism for the management and control of marine resources within the Exclusive Economic Zone and problems related thereto:

13. Major constraints in the development of marine sciences and technology in the country :

14. Assistance received (kind and duration) from the United Nations system (e.g., FAO, Unesco, UNEP, UNDP):

15. Assistance received (kind and duration) from sources other than the UN system :

16. Treaties, conventions, etc :

ANNEX 6

OPENING ADDRESS

by

E. Lartey,
Acting Director, Natural Resources Division
ECA, Addis Ababa, Ethiopia

Mr. Chairman,
Distinguished Experts,
Ladies and Gentlemen,

It is with great pleasure that I welcome you all, on behalf of the Executive Secretary of the United Nations Economic Commission for Africa, to Addis Ababa and to ECA headquarters. It is my hope that those of you who are visiting ECA for the first time will take the opportunity of your one week stay here to learn something about the work of this Commission and acquire an understanding of its organization. Put in a nutshell, the mandate of ECA is to guide and promote the economic development of Africa. The operations of ECA should accordingly be of interest to all of us who come from Africa in particular and also to those of us who come from other parts of the developing world. On behalf of the organizations within the United Nations system that are co-operating in the project for which you have assembled, principal among which are ECA, Unesco, FAO and UNEP, I wish to express our appreciation of your positive response to our invitation to participate in the project.

May I also take this opportunity to express our special gratitude to the UNDP for their financial assistance which has enabled us to embark on this project for the development of marine science and technology in Africa.

This occasion represents a satisfactory culmination of the strenous and persistent efforts by ECA commencing as far back as the late sixties to generate action in the area of "Resources of Sea" to ensure that African countries are enabled to exploit to their advantage the marine and sea-bed resources of the African coastline.

This meeting is a major activity in the preparatory activities mapped out by ECA and Unesco in the project document entitled : the Development of Marine Science and Technology in Africa, within the framework of a recently signed Memorandum of Understanding between the two organizations. The project is an attempt, inter-alia, at presenting African policy-makers and planners with major issues in the development of marine science and technology in Africa, so that meaningful decisions could be made and required actions taken for the development of relevant capabilities in this field.

For the last hundred years, science and technology have spearheaded the transformation of agriculture and industry and the economies of the industrial countries of the world. This momentous transformation has so far by-passed the developing countries. In the developing countries in recent years,

there has been an increasing awareness and recognition of science and technology as effective means of attaining their own transformation and of sharing prosperity with the industrial countries in a world of increasing interdependence.

At the same time these countries have understood that the pace and direction of technological change are a consequence not so much of stages of growth, but of deliberate social, economic and political choices.

Their government, already coping with a complexity of means to provide their people with a more secure and brighter future, need therefore to devise strategies for the technological transformation of their societies.

With regard to the African continent, a few characteristic features will suffice to illustrate the need for urgent and resolute action to provide the science and technology base which is a sine qua non for progress and prosperity for the countries and people of the continent.

African countries:

- possess the lowest share of scientific and technological capabilities of any region in the world;

- have the largest number of least developed, land-locked, island and most seriously affected developing countries;

- vast majority of populations live in rural areas;

- large expanses consist of areas stricken by or susceptible to natural disasters.

Recent events which I will immediately proceed to narrate to you have demonstrated the crucial importance and timeliness of the project on which we are all embarking. It is not a matter of mere coincidence that the culmination of world-wide concern for the strengthening of the scientific and technological capabilities of the developing countries in the UN Conference on Science and Technology for Development held in Vienna, August 1979, occurred simultaneously with global preparations for the third UN Development Decade. It was a fitting symbolization of the crucial role of science and technology in socio-economic development.

The African contribution to the evolution of a global strategy for this third UN Development Decade took the form of an African Development Strategy which was adopted by Africa's highest decision-making body, namely the Summit of Heads of State and Government of the Organization of African Unity, at its session in Monrovia, Liberia, in July 1979.

For the translation of this Monrovia Strategy for the Economic Development of Africa into operational terms, several actions were undertaken both at ministerial and technocrat levels. All these actions resulted in the elaboration of Plan of Action by the ECA Conference of Ministers Responsible for Economic Development at its meeting held here in Addis Ababa 9-12 April 1980.

This Plan of Action was presented to the Economic Summit of Heads of State and Government of OAU in Lagos, 28-29 April 1980, and, with a few amendments, was adopted by the Summit.

The Plan of Action, having thus received the approval of Africa's highest decision-making body, is the agreed framework for economic development of the African continent.

The Monrovia Strategy from which the Plan of Action was elaborated, set as the first priority the field of Food and Agriculture. The Food and Agriculture Chapter of the Plan of Action which was jointly prepared by OAU, ECA, FAO, IFAD, WFC and AFDB, includes fisheries in the areas requiring first priority attention.

The development of fisheries resources has accordingly been placed on a high pedestal. Efforts such as those on which we are presently engaged have therefore been given the required political impetus, and the task and mission which constitute your present assignment have come at an opportune time.

In the case of Africa, there exists a staggering range of challenges in the demand for scientific research and technological invention. But the plural character of most of our economics, as reflected in the manner in which activities are carried out in the existing enclaves and semi-enclaves between industry, agriculture and the service sectors, within agriculture, mining and industry, in education and other sectors prevents these challenges from being expressed as effective demands for the use of indigenous, imported or adapted technology which will point the way to the production of goods and services for the betterment of all.

As we enter the third United Nations Development Decade, Africa finds itself at a rather low level of utilization of Science and Technology in Development, inspite of the general awareness that Science and Technology are critical elements in the development process.

Attempts have been made towards establishing policies for science and technology through the creation of national machineries (e.g., councils for scientific research, research councils, ministries of research and technology etc...), but to date few would express satisfaction at the effectiveness of these institutions in bringing about an endogenous development of science and technology. Scientific communities and their activities are often outposts of advanced countries science, having limited links with economic and social realities which surround them. In this context there is little demand for the results of local research and development, and local science and technology activities are alienated from the mainstream of national technological development. Policy for local generation of science and technology is divorced from policy for acquisition of imported technology, though in fact the two should be mutually complementary and form one common policy base. Indeed some of the root causes of the marginalization of local science and technology systems can be traced to the negative influence of the importation of technology.

On education and training of scientific and technological manpower the region faces a critical manpower situation as it does not yet produce the

sufficient numbers and in the required mix to meet increasing requirements. Serious gaps exist in course offerings in institutions of secondary and post-secondary education and training in relation to development needs and goals, and many courses necessary for equiping indigenous personnel with skills to manage the technological revolution are either missing or not adequately provided. The curricula and approach to skill acquisition whether through formal or informal education has to emphasize the importance of education for innovation rather than imitation. Serious plans for the utlization of opportunities for "learning by doing" offered by large scale investment projects in our countries hardly exist.

The small pool of available indigenous scientific and technical manpower is either untrained, or is denied the opportunity for experience in such important aspects of project development as feasibility studies, project formulation, evaluation and design, start-up and monitoring of execution. Skills for such activities are sought from abroad and paid for in foreign exchange. Some of the resources used to hire foreign skills could and should be channelled into the development and strengthening of local capabilities.

Innovative skills which are scattered everywhere in the informal sector of the economy are ignored, though their potential and actual impact and contribution to the diffusion of technology are undisputed.

In the area of science and technology policy, both content and methodology for formulation are vaguely conceived in many quarters. Formulation of technology policy lacks the necessary inputs from research. The information and data base which is necessary for the management of technological resources is often non-existent as is the case with the development of other national resources.

Africa is now in the grip of technological backwardness and technological dependence on industrialized countries. New initiatives are called for as a consequence of underdevelopment, the wasteful exploitation of resources, the marginalization of the indigenous science and technology systems, and the cost (direct and indirect) incurred in the process of acquisition of foreign technology.

The scenario expressed above in general terms is also true when the situation in marine science and technology is examined. African countries have not done much to develop capabilities in this field which would enable them to exploit the potentialities of their marine resources.

In recent years there has been a general realization that the terrestrial resources of the world may, in the not too distant future, be insufficient to satisfy the demands of human existence in the way of adequate food, energy and industrial development. This realization has forced nations especially in the developed parts of the world to look more and more into the oceans as important reservoirs of food for the rapidly increasing human population, and as sources of raw materials, and energy for industrial development. This realization of the great potential of the oceans for the continued existence of man has come about as a result of the great advances in science and technology in recent times, advances which have brought

practically all the resources of the world, including those of the oceans, within reach of human exploitation. Already many developed maritime states are deriving considerable proportions of their food, minerals and energy needs from the sea.

The third United Nations Conference of the Law of the Sea by recognizing the right of coastal states to extend their sea-ward boundaries to 200 miles has brought vast living and non-living resources under the jurisdiction of coastal states. The national exploitation and utilization of these resources will call for high-level marine science and technology know-how and a complex infrastructural and administrative machinery both of which will require very considerable financial and manpower inputs.

Distinguished Experts,

The question I would like to pose for your consideration is whether Africa's policy-makers and planners are really aware of the implications of these current trends?

- the responsibilities of maritime status vis-à-vis the outcome of the Law of the Sea Conference;

- the problem of maintaining the 200 mile Exclusive Economic Zone for African maritime states - collaborative measures and technical requirements?

- the establishment and maintenance of national sovereignty over resources of the sea, including fisheries;

- the pollution of off-shore areas due to oil exploration, merchant marine movements, fishing operations etc.?

- the problems of identification, exploration, evaluation and exploitation of the natural resource base in this context?

- the typology of mineral resources and the plate tectonic picture of the East and West coasts of Africa?

- the development of relevant industries and arrangements for inter-African trade?

- mechanisms for developing know-how on management and finance?

- the development of relevant manwpoer at all levels of operation in marine science and technology?

- the requisite legislation and machinery for the implementation of the required plan of action?

The answers to most of these questions, I am afraid, may turn out to be a resounding NO, when the following observations are made;

Practically all African (coastal) States are only making minimal use of their marine resources and in most of them even this minimal use is limited to the more accessible inshore (or nearshore) living resources. The exploitation of the non-living resources of the sea i.e., minerals and oil, and of the deep sea living resources are very much underdeveloped in these countries. At present the very rich open sea and deep sea fisheries resources of African coastal states are being exploited by fishing fleets of other nations with little or no benefit to the countries concerned. The main cause of this unsatisfactory situation has been the low level of marine science and technology development in these countries coupled with the lack of adequate administrative and organizational machinery.

It is clear, therefore, that if African coastal States are to derive maximum benefit from their exclusive economic zones, they must within the next few years develop the necessary facilities, without which these resources will continue to find their way to the further enrichment of other countries. It is also important that African countries should within a reasonable time be able to participate meaningfully with other countries in the exploitation of the sea and the sea-bed beyond the areas of national jurisdiction, which is to be regarded as the common heritage of mankind and whose resources are to be used for the benefit of poor and disadvantaged countries. Thus it is clear that in the field of marine science and technology the clarion call in Africa today is, for more training of scientists and technologists at all levels in appropriate disciplines; for more efficient use of existing research, development and training institutions, for the establishment of such institutions where they are non-existent; and for the appropriate administrative and organizational machinery.

Distinguished Experts,

Let us now briefly examine the terms of your mission. During this Group Meeting, you are expected to acquaint yourselves with some of the most important activities concerned with marine science and technology development that have taken place in the past, are taking place now or are planned for the future in African coastal States on a regional, subregional or individual country basis. These activities may be in the field of training at different levels in marine science and technology, in research and development, trade and industry, pollution control, fishery and oceanographic surveys, conferences, seminars, workshops, etc., and they may have been carried out under the sponsorship of different United Nations organizations or government or private agencies. Much of this information will be obtained from the main working paper, but is is unlikely that you will find the information contained in the paper exhaustive. We hope that in some cases the information might be updated or made more complete by your contributions based on your more intimate knowledge of the current situation in some of the subregions and in some of the countries. It is hoped that at the end of the meeting you will be better informed about the general state of marine science and technology development in African coastal

States, and that this information will enable you to adopt a realistic and relevant approach in the second stage of your task, namely the country missions.

We like to consider your work as a diagnostic exercise aimed at finding out the main impediments and problems associated with the development of marine science and technology in African coastal States, and on the basis of your experience and judicious judgement suggesting remedies for bringing about a rapid improvement of the overall situation. You may be aware of the fact that there have been several attempts by various United Nations and other agencies and by national governments individually and in partnership with other Third World and industrial nations or companies at improving the state of marine science and technology development in Africa but most of them have been planned and executed on an ad hoc basis with limited backward and forward linkages with the rest of the economy, and sometimes with only minimal participation of African marine scientists. Furthermore, most of these exercises have had their interests focussed on rather narrow problem areas, as for example, the improvement of fishing or studies of problems of marine pollution in a limited geographical area. Problems of the type which I have earlier highlighted are hardly examined, and policy-makers must without question be made aware of them. The present project in the execution of which you are now participating, is therefore an attempt to look at the whole problem concerning marine science and technology in Africa in its totality and on an African regional basis and to suggest comprehensive remedial measures which would be equally all-embracing in geographical and subject coverage. Another feature of this project worth noting is that it is being executed mostly by indigenous marine scientists and technologists with intimate knowledge and experience of the problem in the African context. In this exercise you are also being given the benefit of the experience of fellow marine scientists and technologists from other developing countries, and it is expected that this will enrich the comprehensive proposals for action that will emerge as a result of your field visits.

The questionnaire that you are going to use during your country missions have been designed to enable you to obtain as much relevant information as possible concerning the state of marine science and technology in the countries you visit, as well as government policies and attitudes as regards future developments and plans. It should perhaps be stated that these questionnaires are meant to serve as general guidelines and are not intended as substitutes for your own ingenuity in analyzing the situation realistically and scientifically. Nor is it expected that you will take the answers given in response to the questions as the gospel truth needing no further examination or analysis. We would like to think that your reports on your country missions will consist of unbiased expert opinions of the situations obtaining in the countries based on your experience and balanced judgement. It would be important to remember that your reports about the state of marine science and technology in African coastal States and your recommendations for a comprehensive action plan will form the main substance for the Workshop scheduled for January 1981 which is expected to draw up a blueprint for the second phase project for the development of concrete measures to strengthen the capability of African coastal States in making fuller use and hence deriving maximum benefit from their marine resources.

All who were involved in the selection of distinguished experts gathered here today are agreed that they could not have assembled a better group. We have faith in your wisdom and experience, and are confident that you can deliver the goods.

I wish you every success in your deliberations.

ANNEX 7

OPENING ADDRESS

by

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Ladies and Gentlemen,

It is my great pleasure to address you on the opening of this meeting, and to convey to you the greetings of the Director-General of Unesco, Mr. Amadou Mahtar M'Bow, and his best wishes for the successful outcome of your meeting.

During the last decade, there has been a slow but steady increase in efforts to develop marine sciences in Africa. The most obvious efforts were in the fields of marine fisheries, training and research at university level and, more recently, in environmental aspects and in coastal area development.

This development in African Member States is linked to the increasing importance of the oceans on the worldwide scene. In other words, the African coastal states have benefited from:

(i) the international efforts to develop marine sciences;

(ii) the phenomenal increase in the awareness of many countries, particularly Third World countries, of the importance of the sea.

This surge of awareness concentrates on two themes, one on marine environment assisted by the creation of the United Nations Environment Programme (UNEP) and the other on marine resources, following the activities associated with the Third UN Conference on the Law of the Sea (UNCLOS) and the new concepts of the Sea Bed Authority and the Exclusive Economic Zone (EEZ).

Each nation will be able to exploit its living and non-living resources up to a distance of 200 miles offshore, i.e. the width of the EEZ currently being defined by the Third UN Conference on the Law of the Sea. This is the area that will in future fall under the national jurisdiction of coastal states. The outcome of UNCLOS will affect the future development of scientific research in the oceans, particularly oceanographic research carried out by one country in the EEZ of another. Moreover, unrestricted high seas fishing has become a thing of the past, The significance of this and the ways in which coastal states can best benefit from it are only recently becoming understood.

There are many factors in favour of developing marine sciences in Africa. Efforts are being made and will continue to be made on the national and regional levels to enhance the capability of man to make better use of the seas and the coastal areas of Africa. The most formidable task is to guide these efforts through a cost effective and rational development of marine sciences.

One of the greatest drawbacks is the severe lack of trained personnel at different levels in Africa. There now exist more projects, meetings, missions and piles of literature and correspondence than can be handled by the few marine scientists scattered throughout Africa. Without an effective solution to this problem there will be little chance of making any real progress.

The present project on 'Development of Marine Science and Technology in Africa' is expected to answer the question of how best we can develop marine science and technology to meet the requirements of the African Member States. The responsibility of identifying the first step to be taken towards achieving this main rests with you.

Ladies and Gentlemen,

During the last few years, active contacts and consultations have taken place between the Economic Commission for Africa (ECA) and the United Nations Educational, Scientific and Cultural Organization (UNESCO), with a view to developing a framework within which both organizations could co-operate more effectively in providing essential services and technical assistance to their African Member States. These efforts have resulted in an Arrangement between the Director-General of Unesco and the Executive Secretary of the ECA. This Arrangement was signed on 10 May 1979. It is almost one year now since this Arrangement was signed. Marine sciences were mentioned in this document as one of the areas in which "Unesco and the Commission further agree that priority will be given to joint action in respect of programme activities and project coming within the scope of this Arrangmeent".

In fact, since early 1978 and while the Arrangement between Unesco and the ECA was in preparation, active consultation between ECA and Unesco took place to formulate a regional project in marine science and technology to be submitted to UNDP;

Soon after the Arrangement was signed, the marine science project became the first operational project within the framework of this Arrangement. From this, I conclude that your meeting is the first substantive and operational meeting to be convened jointly by the ECA and Unesco. This also demonstrates the confidence we are placing in you, since the outcome of this project will influence greatly the future development of marine science and technology in Africa. Needless to say, the success of this project will enhance not only the prospects of co-operation between ECA and Unesco, but also between the African Member States and the international organizations.

In conclusion, let me express my sincere thanks to the representatives of the UN Agencies participating in this meeting and to our colleagues in the Secretariat of the ECA for their co-operation in preparing and hosting this meeting.

Finally, I wish you all a fruitful and successful meeting.

ANNEX 8

LIST OF ACRONYMS AND ABREVIATIONS

AFDB	AFRICAN DEVELOPMENT BANK
CECAF	FISHERY COMMITTEE FOR THE EASTERN CENTRAL ATLANTIC
ECA	ECONOMIC COMMISSION FOR AFRICA
EEZ	EXCLUSIVE ECONOMIC ZONE
FAO	FOOD AND AGRICULTURE ORGANIZATION
GFCM	GENERAL FISHERIES COUNCIL FOR THE MEDITERRANEAN
ICCAT	INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS
ICES	INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA
ICSEAF	INTERNATIONAL COMMISSION FOR THE SOUTH EAST ATLANTIC FISHERIES
IFAD	INTERNATIONAL FUND FOR AGRICULTURAL DEVELOPMENT
IOC	INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
IOFC	INDIAN OCEAN FISHERY COMMISSION
UNDP	UNITED NATIONS DEVELOPMENT PROGRAMME
UNEP	UNITED NATIONS ENVIRONMENT PROGRAMME
UNESCO	UNITED NATIONS ECUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION
WFC	WORLD FOOD COUNCIL