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The Role of IOC in Training, Education and  
Mutual Assistance in the marine sciences (TEMA)

This paper was prepared by the IOC Secretariat in order to provide background information on Training, Education and Mutual Assistance in the marine sciences (TEMA), to facilitate discussion by participants on this subject.

## Introduction

The Intergovernmental Oceanographic Commission was established in 1960 within Unesco; its primary purpose at that time being to co-ordinate large regional co-operative programmes initiated by oceanographically advanced countries. In the following years investigations such as the International Indian Ocean Expedition were completed and new, more focused programmes such as the Co-operative Investigations of the Caribbean and Adjacent Regions and the Co-operative Study of the Kuroshio and adjacent regions were undertaken. This phase was followed by another during which increasing attention was given to the development of global ocean services. At the same time, the membership of the Commission continued to increase to a present total of 104, of which the majority are developing states.

Activities of the Commission have subsequently followed several new trends which have emerged in recent years. Firstly, the progressive orientation and expansion of IOC scientific activities has contributed to the development of its regional programmes which became one of the major components of the Commission's activities. Secondly, as the importance of training and education was recognized as being directly relevant to all activities of the Commission, it became an integral part of each IOC programme. Thirdly, emphasis has been given to the increasing training and educational needs of the majority of its Member States in order that they are able to fulfil their national objectives in the field of ocean affairs and to participate fully in international programmes of particular interest to them. It is expected that these factors will continue to have high priority in all IOC activities until a higher scientific and technological standard has been achieved by the Commission's Member States as a whole. Thus, a certain restructuring of the activities of the Commission became inevitable.

Yet another but important factor which has significantly influenced the future role of the Commission is the emergence of the new ocean regime as a consequence of the deliberations of the Third U.N. Conference on the Law of the Sea (UNCLOS) which, at the same time that it recognized new rights, placed increasing responsibilities on the Member States, particularly the coastal states, to fulfil their obligations on management of the marine environment and its resources within their expanded zone of national jurisdiction.

Added to this is the recent conclusion of the United Nations Conference on Science and Technology for Development (UNCSTD) in support of a new international economic order. These important international events have placed increasing demands on the Commission to develop a new strategy to cope with the new situations and to resolve such problems as the financial constraints to meet its increasing responsibilities towards its Member States as well as fulfilling its international objectives.

In the following account attempts have been made to describe the development in training, education and mutual assistance activities of the Commission and the contemporary development in marine affairs which will undoubtedly call for changes in strategy.

## Training, Education and Mutual Assistance in the marine sciences (TEMA)

### Activities of the IOC

The IOC is the central co-ordinating body in the field of marine sciences and related ocean services within the United Nations system and, within its statutory provisions, is responsible for promotion of scientific investigations with a view to learning more about the nature and resources of the ocean and developing, recommending and co-ordinating programmes which call for concerted action of its Member States and interested international organizations. In carrying out its functions, the Commission seeks to provide small amounts of assistance and to apply this selectively for catalytic action to foster the development or strengthening of infrastructures in marine science and marine technology, and, when requested to do so, assist local efforts for the formulation of a comprehensive ocean policy. Within its terms of reference, the Commission provides technical assistance through its activity known as Training, Education and Mutual Assistance in the marine sciences (TEMA).

In order to appreciate the role of the IOC in the transfer of marine science and technology, it may be pertinent to have some insight into its various activities relating to ocean science and service at the global and regional levels.

### Nature and scope of IOC programmes

Most of the IOC programmes aim at increasing the "understanding" of the nature of the oceans and its resources as a basis for the multiple uses of the sea. This "understanding" is essential for rational development of activities and for sound management of the marine environment. It can be said that these programmes contribute to the scientific basis needed for the rational exploitation of the resources and for other uses of the sea. Therefore, IOC programmes are in general multidisciplinary and multi-sectorial in nature, involving often other specialized agencies of the UN system, particularly those which are members of ICSPRO, namely UN(OETB), Unesco, FAO, WMO and IMCO.

To cope with the diversity of tasks involved in the objective stated above, the IOC has arranged its activities under three main categories: Ocean Science, Ocean Services, and Training, Education and Mutual Assistance in the marine sciences. The ocean science programmes of global scope are the General Bathymetric Chart of the Oceans (GEBCO) and the Global Investigation of Pollution in the Marine Environment (GIPME), including Marine Pollution Monitoring (MARPOLMON), while those of regional scope are the Investigations of "El Nino", Western Pacific (WESTPAC), Regional Association for the Caribbean and adjacent regions (IOCARIBE), Co-operative Investigations in the North and Central Western Indian Ocean (CINCWIO), IDOE Studies on East Asia Tectonics and Resources (SEATAR), Investigations in the Southern Oceans and Co-operative Investigations in the Mediterranean. In addition, two new major programmes were adopted by the IOC Assembly at its eleventh session in 1979: "Study of Climatic Changes and

the Ocean" (res. XI-3) and "Ocean Sciences in relation to Living Resources" (res. XI-17). The ocean services programmes encompass the joint IOC/WMO Integrated Global Ocean Station System (IGOSS), including the IGOSS Observing System (IOS) and the IGOSS Data Processing and Services System (IDPSS); International Oceanographic Data Exchange (IODE), including the Joint FAO/ICC/UN(OETB) Aquatic Sciences and Fisheries Information System (ASFIS), the Marine Environmental Data Information Referral System (MEDI); and the Tsunami Warning System in the Pacific (ITSU).

Structure of Training, Education and Mutual Assistance in the marine sciences (TEMA)

During the period 1975-78, under a directive from the IOC Assembly, six regional ad hoc meetings were held in different areas of the world. The purpose of these meetings was to assess the training needs of the countries in these various regions and to study ways and means of establishing mechanisms to satisfy those needs. Regional ad hoc TEMA meetings were held in Mexico for the CICAR Area; Casablanca for West Africa; Manila for Southeast Asia; Cairo for the Arab States; Montevideo for South American countries and Karachi for the North Indian Ocean countries. A large number of broad recommendations were made by these meetings which reflected the gross needs of the different regions.

The IOC Assembly at its ninth session held in 1975, by resolution IX-33, called for the holding of the second session of the Working Committee for TEMA to consider how TEMA activities could be further developed in order to meet the needs of the developing countries.

At its Second Session, held in New York (18-23 July 1977) the Working Committee for TEMA carried out extensive analysis of the problems confronting developing countries in the field of marine science. Some of the major elements emerging from that meeting are summarized below:

- The majority of the developing countries may not be familiar with the complexity of the various marine related activities within their own countries and also may not be completely aware of their actual needs in marine science and technology which, in turn, may have accounted for poor participation in IOC activities.
- A realistic diagnosis of their needs will be necessary in order to build up an infrastructure which would enable them to participate effectively in marine scientific programmes of the Commission.
- TEMA cuts across all scientific programmes of IOC and, thus, incorporation of TEMA elements in all IOC programmes will benefit Member States in their plans to build up a sound infrastructure.
- As there exists diversity in the scientific capacity of Member States, exchange of experience and expertise within TEMA in regional and global programmes will be mutually beneficial to both developing and industrialized countries.

- Regionalization should grow as an evolution of regional needs. In view of the nature of oceanographic programmes and the likelihood of their being better carried out through joint efforts, it was felt that natural groupings of Member States aimed at enhancing co-operation between neighbours was highly desirable and that Member States should participate actively in regional research projects, regional training courses and similar activities, which otherwise would be beyond their individual capabilities.
- Although IOC and ICSPRO agencies undertake many joint activities in the marine sciences, these seldom deal with TEMA matters per se. The Co-operation between them therefore needs to be further improved in order to maximize international assistance to developing countries and to avoid unnecessary duplication of effort.
- As the budgetary provisions of the Commission are insufficient to support TEMA activities, and so that TEMA can gain in depth and scope, the need to search for more funding and additional sources of support was evident. In this regard, it was recognized that the Voluntary Assistance Programme would be a most important source of funding and support for TEMA.

The Working Committee adopted twenty-one recommendations dealing with regional ad hoc TEMA meetings, Training Components in IOC Programmes, IOC and the ICSPRO Agencies, Terms of Reference, Possibilities and Alternatives of Action for TEMA, Revised Terms of Reference of the Working Committee for TEMA, Formation of an ad hoc Task Team for TEMA, TEMA Activities at the Regional Level, National Training Contact Scheme, Training of Technicians, Shipboard Fellowships, Visiting Professors and Researchers, Exchange of Curricula, Coastal Zone Management and Marine Pollution, Ocean Engineering and Marine Technology in TEMA, Documentation and Literature Searches, Marine Science Administrators, Instrumentation Calibration and Repair Facilities and Provision of Intercalibration Standards, Inventory of Needs and Resources, Financing of TEMA Activities, Voluntary Assistance Programme (IOC-VAP) and Establishment of New Marine Research Centres and Strengthening of Existing ones.

Based on the recommendations of TEMA-II, the IOC Assembly, at its tenth session held in Paris (27 October - 10 November 1977) adopted resolution X-19 which establishes the Working Committee for TEMA as an intergovernmental body within the framework of the Commission, with terms of reference which, among other objectives, require it to review TEMA needs of developing Member States on a continuing basis; recommend .. programmes of training, education and mutual assistance, particularly those related to IOC programmes in co-operation with other bodies concerned, and review their progress; develop and co-ordinate appropriate mechanisms for their implementation; and arrange assistance in consultation with other subsidiary bodies and specialized agencies of the UN system which are members of ICSPRO.

Within these terms of reference, and to tackle complex problems such as transfer of marine science and technology to its developing Member States relative to its ocean science and ocean services programmes, the IOC initiated steps to arrange that this activity be implemented in four

ways: by setting up mechanisms which can (a) ensure effective dissemination of information and co-ordination of marine science activities at the national level; (b) provide a forum with a mandate to develop and recommend scientific programmes at regional or global levels to serve as the basis for interaction among the participating Member States in a co-operative scientific venture as well as to promote mutual assistance either bilaterally or multilaterally; (c) develop effective forms of co-operation with other international organizations concerned with marine sciences and ocean affairs, particularly those which are part of the UN system; and (d) set up efficient mechanisms which will generate financial assistance to assist developing Member States of the Commission.

#### Co-ordination at national level

- i) At the national level two steps have been taken to allow effective dissemination of information requiring action by interested institutions/organizations in Member States to designate National Training Contacts (NTC). So far 81 Member States have designated such contacts.
- ii) The second important step has been to encourage Member States to establish National Oceanographic Committees or equivalent bodies which could ensure effective co-ordination of marine science activities among institutions/organizations interested in marine research at the national level. So far 50 National Oceanographic Committees or equivalent bodies have been established by Member States and more are likely to be set up in the near future.

#### Co-ordination of scientific activities at regional and global levels

Since most of the IOC programmes are multidisciplinary and multi-sectorial in nature, the task of identifying, recommending, co-ordinating and reviewing them has been assigned to the subsidiary bodies of the Commission. There is thus a subsidiary body for each of those ongoing programmes referred to above. It is important to remember that the detailed scientific operational plan of a given programme is developed, whenever necessary, with the assistance of the advisory bodies of the IOC (SCOR, ACMRR), and is implemented under the authority of the governing bodies, i.e. the Assembly and the Executive Council. Thus the regional machinery so developed provides the main forum which permits a closer interaction among the participating Member States from the region concerned and other interested Member States of the Commission in a co-operative venture, particularly between the developed and the developing states. These arrangements provide an excellent opportunity for fostering transfer of relevant marine science and technology to the developing states.

#### Co-operation with international agencies

Under the umbrella of the Inter-secretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO), composed of the UN(OETB), Unesco, FAO, WMO and IMCO, the IOC performs its

function as a joint specialized mechanism. In this capacity it contributes to the development of effective co-operation between the members of ICSPRO on a general level, as well as in several joint programmes referred to above. In matters relating to TEVA, excellent co-operation exists between IOC and the Unesco Division of Marine Sciences. Co-operation with other agencies is expected to grow, particularly in areas where joint action is involved.

#### Voluntary Assistance Programme of the Commission

Considering the serious financial constraints IOC has been confronted with in meeting the expanding needs of its developing Member States, the IOC Assembly at its tenth session held in Paris in 1977, by resolution X-20, established the Voluntary Assistance Programme of the Commission (IOC-VAP). Its main purpose is to strengthen infrastructure and to develop the marine scientific capacities of the Member States, especially the developing States, so that they are able to participate fully in the programmes of the Commission. Since IOC-VAP is based on the principle of mutual assistance between the developed and developing Member States of the Commission, it undoubtedly can play a potential role in the dissemination of marine science and technology to institutions in developing countries participating in an IOC programme, and also toward advancement of marine science at a global level.

The role of IOC in dealing with IOC-VAP applications is mainly that of a catalyst. Assistance in response to applications can be provided in three ways: (i) where IOC acts in a broker role between the developing and the donor Member States using its much greater access to information about the opportunities that exist - in this IOC withdraws as soon as the contract has been made and the assistance granted becomes part of the donor countries bilateral assistance arrangements; (ii) where IOC acts on behalf of the developing Member States and negotiates for funds or equipment on its behalf; (iii) where IOC acts on behalf of the developed Member States who have contributed in cash to the IOC Trust Fund, exclusively for meeting IOC-VAP applications.

#### TEMA component of IOC programmes

Until recently the IOC has been providing technical assistance to developing states in more general terms, such as short-term shipboard training, study grants and participation of scientists in workshops and symposia. As TEVA has been integrated into all activities of the Commission, the identification of the needs of developing states participating in regional and global programmes are identified by the subsidiary bodies of the Commission responsible for the programmes as well as by the Working Committee for TEVA. In principle the existence of a detailed operational programme is a pre-condition to development of its TEVA component which provides the basis for evaluating actual needs for development of assistance programmes relating to the scientific or services activities of the programmes. The best example for this is the TEVA component of the programme of the Investigations of "El Nino" recently developed. The TEVA component of WESTPAC is likewise being developed and similar steps will be taken as soon as the detailed operational plan of other regional programmes is finalized. In order to ensure effective co-ordination of TEVA activities within the scope of

a given programme, TEMA Co-ordinators have been appointed for each of those programmes. Their responsibility is to review training and other needs in consultation with participating countries and to liaise with the Working Committee for TEMA.

#### Funding for TEMA

One of the major obstacles for implementation of TEMA activities is the lack of adequate funds. The amount spent from the IOC regular budget for TEMA for the last three biennia was as follows:

1975-76	\$102,800
1977-78	\$113,000
1979-80	\$180,800
1981	\$140,000

This was approximately 15% of the IOC regular budget, and the annual increase is below the inflation rate. However, roughly \$100,00 per year of the IOC Trust Fund was devoted to TEMA which brings the total to an average of \$150,000 a year for TEMA.

For 1981-83 increased funding is recommended for TEMA amounting to \$670,500 from the regular budget, and an additional \$100,000 per year is expected as contributions from Member States to the IOC Trust Fund. Assuming that this would be available, the total expenditure on a yearly basis would be about \$320,000. This amount would be used to meet the TEMA needs of Member States participating in 14 on-going regional and global programmes of the Commission. Although funds in support of TEMA have increased considerably, it is nevertheless inadequate considering the needs of the majority of the Member States of the Commission. It is obvious that assistance may be catalyzed by IOC for funding TEMA activities from bilateral and other international support has to be far beyond its present resources.

#### Salient features of implementation of TEMA

As stated earlier, within its mandate, IOC, through TEMA, is responsible for recommending, developing and co-ordinating assistance programmes to its Member States. The assistance provided under TEMA falls into four categories: i) to help participating scientists from developing Member States in scientific workshops with a view to defining the priority needs as part of co-operative programmes, the training and other needs, particularly in relation to approved programmes and/or to develop special courses/curricula for the benefit of developing Member States; ii) to hold specialized training courses jointly with the Unesco Division of Marine Sciences; iii) to provide short-term fellowships for shipboard training and/or to undertake studies in foreign institutions; iv) to develop project proposals for major assistance under UNDP or other international sources of assistance; and v) assistance under IOC-VAP.

Workshops : Assistance is provided to participants from developing countries through the six regional ad hoc TEMA meetings referred to earlier. In addition, the IOC, jointly with the Unesco Division of Marine

Sciences, held a workshop on "Training of Marine Technicians" (NOAA, Miami, USA, 1978), "Preparation of a Syllabus for Introducing Oceanography and the Marine Environment" (United College of Atlantic, South Wales, UK, 1978) and "Coastal Area Development and Management" in Mexico (1979) jointly with UN(OETB) and the United Nations University (Japan). In addition, support was provided to participants in the workshops relating to WESTPAC and CINCWIO.

Training courses : Under the regular programme the IOC, jointly with the Unesco Division of Marine Sciences, held a one month training course for marine science technicians for the benefit of the WESTPAC countries at the Australian Institute of Marine Sciences (AIMS), Townsville, Australia, June 1980; and a training course was held jointly with UNEP on Petroleum Monitoring for the Indian Ocean Region under the Marine Pollution Monitoring Programme at the Australian government's Analytical Laboratories at Cotteslie, near Perth, Australia (February 1980); and an advance training course in Biological Oceanography, jointly with Unesco and in collaboration with the Federal Republic of Germany, is scheduled in March 1981.

Training fellowships : Twenty shipboard training fellowships were provided to scientists from Chile, Ecuador, Fiji, India, Indonesia, Malaysia, Thailand and Tonga for training in research vessels from Japan, the Netherlands, UK and USSR. In addition, 14 study grants were provided to scientists from Algeria, Argentina, Colombia, Chile, Egypt, India, Peru and Thailand to study in France, Mexico, Federal Republic of Germany, UK and USA. Under agreement with the University of Rhode Island and the Oregon State University, USA, the IOC awarded nine fellowships to participants in the Master of Marine Affairs Programme and Marine Resources Management Courses in respective institutions to scientists from the Cameroons, Ghana, Philippines, Mauritius, Nigeria, Somalia and Thailand.

Development projects for major assistance : Steps have been taken to develop regional and sub-regional projects of major assistance relating to ongoing programmes; these include "Programme of training, education, research and monitoring connected with the 'El Nino' phenomenon in the Southeast Pacific" and a preparatory assistance for "WESTPAC (Southeast Asia Project on Marine Sciences for Development". Both these proposals have been submitted by Unesco to UNDP for assistance.

IOC-VAP : Requests received from developing Member States under this scheme are actively being pursued. Under this scheme support has been provided by the government of the Netherlands to the Indonesian request for two fellowships. Training of scientists from developing countries on board research vessels from the USSR has been extended. Facilities for training of scientists from Chile, Colombia, Ecuador and Peru in connection with the 'El Nino' Programme in processing of oceanographic data and analysis of satellite data have been provided respectively by NODC, Washington, and NESS Center, Maryland, USA, in the early part of 1981.

In the above account the major features of structural changes and the mechanisms established at national, regional and global level to facilitate the transfer of marine science and technology to developing Member States within the framework of the Commission, as well as co-operation of IOC with other international organizations and the new approach to improve funding through IOC-VAP have been dealt with. Brief resumé is given earlier of accomplishments, including the nature and extent of assistance provided to developing Member States. Examination of assistance provided to Member States indicates that the magnitude of assistance provided exceeded by far the limited budgetary sources available under TEMA. This may largely be attributed to the part played by certain developed Member States either by way of contributions to the Trust Fund or through provision of assistance through their respective institutions. Although this trend is encouraging the assistance required for implementing TEMA, considering the increased needs of its Member States, far too inadequate.

#### Future directions and new development strategy for IOC-TEMA

In the introductory remark of this paper reference was made to the possible impact of contemporary developments at the international level, particularly those emanating from the deliberations of UNCLOS and UNCSTD, on the future role of IOC and more so in the context of TEMA. Recognition of this has been reflected in several resolutions of the IOC Assembly and the Executive Council which call for new development strategy to cope with new situations in order to ensure the successful role of IOC to meet the aspirations of its Member States on the one hand and to fulfil its global objectives for the understanding of the oceans and resources with concerted action of all its Member States on the other. For better appreciation of the steps proposed by the Commission to cope with future problems, it is desirable to have some insight into the nature and scope of these developments.

#### Implications of the U.N. Conference on the Law of the Sea

The Draft Convention on the Law of the Sea (Informal Composite Negotiating Text - ICNT) makes specific reference to a number of actions to be taken by Member States as well as by the international organizations on the subject related to protection and preservation of the marine environment, the conduct of marine scientific research, the transfer of marine science and technology and the establishment of an International Sea Bed Authority. The nature of the actions required to be taken can briefly be summarized as follows:

The obligations that the states will share, in accordance with this Draft Convention, inter alia, will be as follows:

- Protection and preservation of the marine environment, including measures for controlling pollution in areas of national jurisdiction.
- Co-operate directly or through international organizations on regional and global bases for promoting studies, undertaking programmes of

research, exchange of information and data acquired relating to preservation of the marine environment.

- Promote, directly or through international organizations, development and conduct of marine scientific research, provide information on major programmes, disseminate knowledge resulting from marine scientific research to developing states, as well as strengthening their research capabilities through adequate education and training of technical and scientific personnel.
- Promote, directly or through international organizations, acquisition, evaluation and dissemination of marine technological knowledge, including development of appropriate marine technology, the development of human resources through training and education of personnel of developing states and through international co-operation at all levels including regional, sub-regional and bilateral levels.
- Establish programmes of technical co-operation for the effective transfer of all kinds of technology, including holding conferences, seminars and symposia, on scientific and technological subjects, in particular on policies and methods for transfer of marine technology and promote exchange of scientists.
- Promote international co-operation for the development and transfer of marine technology and, where possible, to be carried out through existing bilateral, regional or multilateral programmes and also through expanded and new programmes in order to facilitate transfer of marine technology, particularly in new fields and appropriate international funding for ocean research and development.
- Establish, directly or through competent international organizations, national and regional marine scientific and technological centres, especially in developing states, in order to stimulate and advance the conduct of marine scientific research to strengthen their national capabilities to utilize and preserve their marine resources for economic benefit.
- Promote, directly or through competent international organizations, the development of marine scientific and technological capacity by providing technical assistance on request with regard to exploration, exploitation, conservation and management of marine resources, the protection and preservation of the marine environment and marine research.

#### Implications of the U.N. Conference on Science and Technology for Development

By resolution 34/218 of 19 December 1979, the General Assembly of the United Nations endorsed the resolution of the United Nations Conference on Science and Technology for Development (UNCSTD), held in Vienna, Austria, 20-31 August 1979, which includes, inter alia:

(a) the adoption of the "Vienna Programme of Action" on Science and Technology for Development in support of a new international economic order; and (b) the establishment of an Intergovernmental Committee on Science and Technology for Development.

The "Vienna Programme of Action" focuses attention on the following three broad areas:

- i) "Strengthening the scientific and technological capacities of the developing countries;
- ii) restructuring the existing pattern of international scientific and technological relations;
- iii) strengthening the role of the United Nations in the field of science and technology and the provision of increased financial resources".

The requirements for specific action set forth by the "Vienna Programme of Action" at the national, sub-regional, regional, inter-regional and international levels are as follows:

- Creation and/or strengthening of the policy-making capacity of developing countries in scientific and technological matters;
- Promotion of the self-reliant efforts of the developing countries to improve and strengthen their scientific and technological knowledge and capacity to enable them to apply science and technology to their own development;
- Restructuring of existing international co-operation so as to promote a better distribution of world production and resources in the fields of science and technology;
- Allocation of adequate financial resources for the development of science and technology in and for the developing countries;
- Strengthening of scientific and technological co-operation among developing countries;
- Strengthening of co-operation between the developing and developed countries in the application of science and technology.

The above objectives set forth under the "Vienna Programme of Action", which also apply to high priorities to marine sciences and ocean affairs, will require the identification by developing countries of sectorial priorities at national, sub-regional, regional and inter-regional levels and the implementation of related programmes - utilizing the world's available scientific and technological potential.

Pending the establishment of the long-term arrangements for the Financing System, the General Assembly, vide resolution referred to above, approved the establishment of a United Nations Interim Fund for Science and Technology for Development of no less than \$250 million to be sustained by voluntary contributions for the year 1980-81. This fund will be administered by the UNDP under policy guidance and general principles set forth by the U.N. General Assembly (resolution A/RES/34/218, Annex).

The purpose of this fund will be: a) to strengthen endogenous scientific and technological capacities of the developing countries; b) to promote the strengthening of international co-operation in the field of science and technology for development by promoting co-operative arrangements through which developed countries may provide effective support to developing countries, and by supporting co-operative arrangements among the developing countries at the sub-regional, regional and inter-regional levels; and c) to support, promote and initiate, if appropriate, the activities necessary to prepare for future efforts to strengthen the scientific and technological capacities of the developing countries.

In accordance with the provision, the Interim Fund shall establish close and continuous working relationships with the organizations of the United Nations system, in particular the Centre for Science and Technology for Development (established under resolution 34/218 of the U.N. General Assembly), the specialized agencies and other United Nations entities concerned, and shall ensure their involvement, as appropriate, in the identification, formulation, appraisal, execution and evaluation of projects.

#### Recommendations of TEMA-III

The third session of the Working Committee for TEMA, held in Buenos Aires, 21-26 April 1980, among other things devoted greater attention to the problems arising from, as well as the implications of, the new ocean regime resulting from the deliberations of the Third U.N. Conference on the Law of the Sea on the future role of TEMA. Some of the highlights of the agreement reached by the Working Committee for TEMA are as follows:

- The nature and scope of TEMA must be considered in light of the new legal regime emerging from UNCLOS and, therefore in light of the need for national marine development, joint and co-operative arrangements of states, participation by developing countries in activities of the IOC and of the international organizations concerned with marine affairs, especially those specialized agencies of the U.N. system which are members of ICSPRO.
- There is a need for assessment of TEMA needs by IOC and the governments directly concerned with a given programme, and to encourage Member States to collaborate actively in the preparation of "country profiles" as a basis for the diagnosis of national needs in the field of marine sciences and related infrastructures.

- The National Training Contact, in view of the importance for TEMA activities and considering the lack of adequate facilities, be located within bodies such as the National Committee for Oceanography with appropriate secretariat support and with access to relevant authorities concerned with marine science.
- Marine scientific and technological research is an essential basis for rational use of the oceans and of the resources and for the protection of the environment, and that adequate national capacities are prerequisites for effective transfer of knowledge and technology, as well as effective international co-operation in marine affairs on global, regional and sub-regional levels.
- Regional programmes should be built on existing institutions and the achievement reviewed by the Working Committee for TEMA on a continuing basis.
- The IOC should explore possibilities of funding for TEMA related activities by preparing regional or sub-regional projects based on priority programmes for assistance under the UNDP and Interim Fund for Science and Technology for Development and by requesting potential donors to contribute to the IOC Trust Fund or by way of fellowships.
- As IOC-VAP has the potential for promoting as well as facilitating bilateral agreement between the donor and recipient Member States, the Committee urged potential donor Member States to establish appropriate national machineries responsible for funding, administration and/or co-ordination of assistance programmes for developing countries and to contribute to the IOC Trust Fund earmarking funds for meeting IOC-VAP requests as well as through allocation of fellowships.

The statement of the UN representative was particularly relevant in these respects, both in the emphasis placed on the need to develop national marine policies and to strengthen the scientific and technological capabilities of the developing countries. The Committee took note of the Conference's proposal to establish a special training programme in seabed mining and related activities prior to entry into force of the Convention, and of the contribution that the IOC, through the Working Committee for TEMA, would be expected to make both for the planning and implementation of such a programme. The Committee therefore considered that, in this context, an even higher emphasis be placed on matters related to training, education and mutual assistance in the marine sciences.

TEMA-III adopted recommendation TEMA/III.1 which calls for IOC to plan a major programme of assistance to its developing Member States. This recommendation was considered by the IOC Executive Council at its thirteenth session, held in Paris (23-28 June 1980), which decided (resolution EC-XIII.15) "that a comprehensive plan for a major assistance programme aimed at strengthening the marine science infrastructures in developing Member States be developed to enable them to achieve their national goals in the field of ocean affairs, and to participate fully in global, regional and sub-regional oceanographic research programmes of the Commission".

The Executive Council recognized that a programme of the magnitude envisaged would require support and urged "bilateral and multilateral funding agencies, particularly the United Nations Development Programme and the Interim Fund for Science and Technology for Development to give favourable consideration to joining their efforts to finance the major assistance programme in marine sciences and technology for development, as recommended by TEMA-III". To this end, the Executive Council instructed the IOC Secretary:

"to prepare, in co-operation with the TEMA ad hoc Group for Co-ordination and Implementation, or with consultants, an outline for such a plan, and guidelines for a strategy for its implementation, to be submitted to the Twelfth Session of the Assembly for approval".

In the discussion which resulted from the above resolution, the Executive Council recognized the major implications of the new ocean regime resulting from the UNCLOS as well as from UNCSTD. These activities were closely linked with the movement towards a new international economic order. Most of the general proposals in the "Vienna Programme of Action", resulting from UNCSTD, are applicable to the use and management of the marine environment.

In conclusion, one may say that rational use of the sea and its resources depends to a great extent upon the capacity of an individual state for scientific research. Since experience has shown that science can thrive only through intra- and inter-disciplinary interaction, the development at the institutional level and the subsequent congregate capacity of a state can be at best achieved through co-operative ventures which optimize national efforts through bilateral and multilateral arrangements.

Contemporary developments concerning the new ocean regime call for the formulation of national marine science policy by concerned Member States. Extension of national jurisdiction by coastal states has created an imperative for co-operation and mutual assistance among neighbouring states and consequently between them and other states. Over the years a pattern of co-operative programmes has developed bilaterally or through competent international organizations and procedures for planning, financing and implementing have been worked out. Because modern marine management is beset with numerous scientific and technological problems, the solution to this problem requires, among other things, scientific input to the formulation of realistic goals.

Marine science is an expensive undertaking; increases in both in terms of inflation and real cost of equipment services and other material resulting from their sophistication and also from inflation has in recent years posed additional obstacles for its development in many developing and small states. The same may be said for the developed states, though from a different perspective. In the face of such constraint, the best strategy seems to look for cost-effective approaches and efficient

economic utilization of international resources in solution of problems which aim at providing better understanding of the sea and its resources.

The IOC has recognized the urgent need for assistance to its developing Member States on the one hand and the need for global understanding and collaboration about ocean affairs on the other. For the reasons mentioned above, the concerted action in the field of training, education and mutual assistance called for adequate diagnosis of the national, regional and global requirements in the field of marine science, ocean affairs and related aspects, effective exchange of the relevant information amongst donor and recipient countries, as well as concerted action with a view to maximizing the use of available funds and means.

The mechanisms that IOC offers through its various subsidiary bodies, including the regional ones, and through its close collaboration and complementary action with the Division of Marine Sciences of Unesco, and as a joint specialized mechanism of the organization members of ICSPRO, present appropriate strategy to deal with the question of transfer of marine science and technology to the developing Member States.