Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

ROPME-IOC Meeting of the Steering Committee on Oceanographic Co-operation in the ROPME Sea Area, Organized in Co-operation with UNEP

Kuwait, 24-27 September 1991

UNESCO

ROPME-IOC/STEER-I/3
Paris, 8 February 1992
English only

In this Series, entitled

Reports of Meetings of Experts and Equivalent Bodies, which was initiated in 1984 and which is published in English only, unless otherwise specified, the reports of the following meetings have already been issued:

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
3. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of «El Niño» *(Also printed in Spanish)*
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP(SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping *(Also printed in French and Spanish)*
12. Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
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19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica *(Spanish only)*
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
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27. Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans *(Also printed in French)*
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29. First Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
30. First Session of the IOCARIBE Group of Experts on Recruitment in Tropical Coastal Demersal Communities *(Also printed in Spanish)*
31. Second IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
32. Thirteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asia Tectonics and Resources
33. Second Session of the IOC Task Team on the Global Sea-Level Observing System
34. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
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45. Ninth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
46. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
47. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
48. Twelfth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
49. Fifteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
50. Third Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
51. First Session of the IOC Group of Experts on the Global Sea-Level Observing System
52. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean
53. First Session of the IOC Editorial Board for the International Chart of the Central Eastern Atlantic *(Also printed in French)*
54. Third session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico *(Also printed in Spanish)*
55. Fifth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
56. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
57. First Meeting of the IOC *ad hoc* Group of Experts on Ocean Mapping in the WESTPAC Area
58. Fourth Session of the IOC Consultative Group on Ocean Mapping
59. Second Session of the IOC-WMO/IGOSS Group of Experts on Operations and Technical Applications
60. Second Session of the IOC Group of Experts on the Global Sea-level Observing System
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62. Third Session of the IOC-FAO Group of Experts on the Programme of Ocean Science in Relation to Living Resources
63. Second Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
64. Joint Meeting of the Group of Experts on Pollutants and the Group of Experts on Methods, Standards and Intercalibration
65. First Meeting of the Working Group on Oceanographic Co-operation in the ROPME Sea Area
66. Fifth Session of the Editorial Board for the International Bathymetric and its Geological/Geophysical Series
67. Thirteenth Session of the IOC-IHO Joint Guiding Committee for the General Bathymetric Chart of the Oceans *(Also printed in French)*
68. International Meeting of Scientific and Technical Experts on Climate Change and Oceans
69. UNEP-IOC-WMO-IUCN Meeting of Experts on a Long-Term Global Monitoring System
70. Fourth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
71. ROPME-IOC Meeting of the Steering Committee on Oceanographic Co-operation in the ROPME Sea Area

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1. OPENING

1 The meeting with 20 participants in attendance (Annex II) started at 10 a.m. on 24 September 1991.

2 His Excellency Dr. Abdul Rahman Al-Awadi, Executive Secretary of ROPME, welcomed all participants to the ROPME Secretariat. He expressed appreciation to all countries, agencies and individuals who had contributed in one way or another to the national and international/regional efforts aimed at ameliorating the environmental degradation in the ROPME Region caused by war related oil spills and burning oil wells. He praised the activities undertaken by the various agencies under the concluded phase of the United Nations Interagency Plan of Action for the ROPME Region co-ordinated by UNEP. He particularly welcomed the present initiatives taken by IOC of UNESCO to collaborate with ROPME in addressing the pollution problems in the coastal and marine environment noting that there is great similarity between the mandates and programmes of IOC as a global Oceanographic Commission and ROPME as a Regional Marine Environmental Organization. He expressed the hope that the co-sponsorship of the Steering Committee would mark the beginning of greater visibility for IOC in the ROPME Region.

3 In concluding his remarks, Dr. Al-Awadi emphasized how important it was to achieve concerted action and to avoid duplication of efforts in the projected activities. He formally declared the meeting open and wished the participants successful deliberations.

4 Dr. Chidi Ibe, Senior Assistant Secretary of IOC, in his speech conveyed to the meeting fraternal greetings and the warm regards of the IOC Secretary, Dr. Gunnar Kullenberg, who, he said, would have wanted very much to be present personally but was prevented by other exigencies of his office. He informed the meeting that Dr. John A. Knauss, who was at the Meeting in his capacity as the Administrator of the National Oceanic and Atmospheric Administration (NOAA), USA, is also the first Vice-Chairman of the IOC, and that IOC was therefore represented, in part, at very high level.

5 Dr. Ibe said that the Integrated Project Plan was a product of the First Meeting of the IOC Working Group on Oceanographic Co-operation in the ROPME Sea Area, held in Paris during 12-14 June 1991. The Meeting recommended the setting up of a Steering Committee to give the Integrated Project Plan operational viability including details of budgeting. IOC promised to approach ROPME on how best such a Steering Committee would function. This First Joint ROPME-IOC Meeting of the Steering Committee has been designed as a Working Session and the participants have been chosen in such a way so as to ensure as broad a spectrum of opinion and resources input as possible.

6 Dr. Ibe then thanked Dr. Abdul Rahman Al-Awadi, Executive Secretary of ROPME, and Dr. Badria Al-Awadi, Co-ordinator (Technical and Administrative) for their kind considerations in the period leading up to the Meeting and for their warm hospitality, and expressed his hope for a rewarding meeting.

2. ORGANIZATION OF WORK

2.1 ADOPTION OF THE AGENDA

7 The Provisional Agenda (Document ROPME-IOC/STEER-I/1 Prov.) which had been circulated to participants prior to the Meeting was adopted without amendments as the Agenda (see Annex I for the meeting).

2.2 ELECTION OF CHAIRMAN AND THE RAPPORTEUR

8 Dr. Nizar Tawfiq, Vice-President of Meteorology and Environmental Protection Administration (MEPA), Kingdom of Saudi Arabia, was proposed as Chairman of the Meeting and elected by acclamation.

9 Professor El-Sayed Mohammed Hassan, University of Qatar (State of Qatar), was elected as Rapporteur for the Meeting.

2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

10 A Provisional Timetable and a List of Documents (Documents ROPME-IOC/STEER/1-4 Prov.) were presented (Annex X). It was agreed that the main working document will be the "Integrated Project Plan for the Coastal and Marine Environment of the ROPME Region" prepared at the 12-14 June 1991 Meeting in Paris.

3. REPORT OF THE UN INTERAGENCY PLAN OF ACTION

11 Dr. Makram Gerges, Senior Programme Officer, OCA/PAC, UNEP, presented his Report on the concluded phase of the UN Interagency Plan of Action for the ROPME Region (Annex III). He also informed the meeting that certain approaches had been made to UNDP with a view to obtaining further funding for the next phase.

4. DISCUSSION OF INTEGRATED PROJECT PLAN FOR THE COASTAL AND MARINE ENVIRONMENT IN THE ROPME REGION

4.1 INTRODUCTION OF THE PLAN

12 The IOC Representative introduced the Integrated Project Plan for the Coastal and Marine Environment in the ROPME Region (Annex IV) as adopted at the Paris Meeting, 12-14 June 1991.

4.2 INTRODUCTION OF RELATED ROPME PROGRAMME

13 Dr. Badria Al-Awadi, Co-ordinator (Tech. & Admin.), ROPME, introduced elements of the approved programmes of ROPME and highlighted their similarity to the Integrated Project Plan (Annex V).

4.3 INTRODUCTION OF OTHER RELATED INTERNATIONAL PROGRAMMES COUNCIL OF EUROPE, CEC, ETC.

14 Professor Jean M. Jaubert, Director, European Oceanographic Observatory, Monaco, reported that under the Council of Europe, Open Partial Agreement on Major Natural and Technological Disasters, investigations are proposed to assess the ecological impact of war-related marine and atmospheric pollution of unprecedented scale on selected coral reefs and define their evolution in time. The ultimate purpose of the proposed project consists of providing coastal managers and decision-makers with updated reports on risk assessment along with suitable plans for conservation, restoration or 'rescue' operations. The scope of work includes baseline survey, dynamics of the decay and/or recovery process, environmental monitoring, ecophysiological investigations, genetic studies, laboratory simulation of environmental stress and techniques involved in the rehabilitation of damaged reefs.

15 Dr. Kathryn Burns, IOC/NSF Consultant, gave a synopsis of a detailed Project Plan entitled "Proposal to assess the distribution, fluxes and impact of oil and oil burn products in the ROPME Sea Area" which she had prepared for IOC under funding from the US National Science Foundation. This proposal was foreseen as an IOC contribution to the United Nations Interagency Plan of Action and that it would be submitted formally to the ROPME/UNEP Meeting, 28-30 September 1991. A copy of this document was given to ROPME for information.

16 Mr. Alessandro Barisich, Head of Civil Protection Unit, of the Commission of the European Communities (CED) discussed the CEC's initiatives concerning marine pollution in the ROPME Sea Area and stated that:

(i) The EEC Task Force for dealing with accidental pollution at sea was seconded to the concerned authority in Saudi Arabia from 4 February to 11 July 1991.

(ii) The Commission of the European Communities has contributed 1 Million ECU ($ 1.1 Million) to the Trust Fund of IMO.

(iii) An "Ecological Initiative" consisting of the establishment of a Marine Habitat and Wild Life Sanctuary in the ROPME Sea Area has been launched in co-operation with concerned authorities in Saudi Arabia; the Commission's contribution to this project will be 2 Million ECU ($ 2.3 Million). This "Ecological Initiative" is considered by the Commission as particularly important, because it could become a model for similar initiatives to be implemented in other areas of the ROPME Region.

17 He also explained his Commission's involvement in Atmospheric Pollution and Health Impact Studies.

18 Dr. R. Engelhardt, Vice President, Marine Spill Response Corporation (MSRC) explained that MSRC is a national response organization, established by the oil and oil product transporting industry in the USA, and presented the Research and Development activities of his Corporation in relation to oil spill response.

19 MSRC has identified its primary priorities for R & D Funding for the next several years. The programme, includes (but is not limited to) research in:

(i) effectiveness of shoreline countermeasures, including bioremediation and the option of no action.

(ii) Remote sensing of oil spills and real time image processing.

(iii) Sensitivity studies of coral reefs and mangroves dispersant studies.

(iv) Oily material handling and disposal.

(v) On site burning (fate and effect of burn products; human health effects).

(vi) Maintenance of a current global R & D database.

(vii) Spill trajectory modeling for incorporation into a spill response operations information system, etc.

4.4 SCIENTIFIC ELEMENTS

4.4.1 **Details of investigations to be undertaken in the short and long-term**

20 Following a brief discussion about details of the data and information required by decision-makers in the Region to address the environmental degradation caused by the recent war, the meeting agreed on an Updated Integrated Project Plan that will form the basis for implementation (Annex VI). The Committee also took cognizance of IOC's lead responsibility for the coastal and marine component of the UNEP co-ordinated UN Interagency Plan of Action.

4.4.2 **Sampling strategies and methodologies including synchronization of sampling**

21 The participants recognized that the methodologies for accomplishing the scientific programme are well established and published under the Reference Methods for Marine Pollution Studies Series of UNEP. It was agreed that the "Manual of Oceanographic Observations and Pollutant Analyses Methods "MOOPAM)" should form the basis for undertaking the proposed studies where applicable, and sampling should be synchronized to improve inter-comparison of results where applicable.

4.4.3 **Analytical techniques**

22 It was agreed that for inter-comparability of results, the techniques described in the ROPME Manual "MOOPAM" should also form the basis for the analysis of the samples collected where applicable.

4.5 HUMAN RESOURCES AND SCIENTIFIC INFRASTRUCTURES/FACILITIES

23 It was recognized that a crop of trained scientists and appropriate analytical facilities in the region are limited and over-stretched, and therefore there will be need for outside experts to help out with field work and to analyze samples in reputable laboratories outside the Region.

24 The meeting recommended an expansion in IOC capacity building programmes in the Region. It was recommended that an intensive scheme for manpower development be launched under IOC's Training, Education and Mutual Assistance Programme (TEMA).

4.6 FINANCIAL RESOURCES

25 The estimate of the costed elements of the updated Integrated Project Plan is slightly in excess of US$ 11,000,000. The costs of the remaining elements are yet to be determined. The cost of the immediate (3 months) part of the Plan is not included in the budget of the Integrated Project Plan.

26 The meeting recognized that all avenues of funding must be explored. The United Nations Agencies such as UNDP, UNEP, IOC, etc. as well as individual nations, oil companies, banks, non-governmental organizations, research institutions, universities, etc. were identified as possible sources of assistance.

27 The meeting identified ROPME as a major motivating factor in fund raising. It also recognized the potentials of other arrangements for funding.

28 The meeting was informed of the possible donation of a Research Vessel from NOAA through IOC for an Oceanographic Cruise in the Region in early 1992. Dr. John Knauss, the Under-Secretary for Commerce and Administrator of NOAA, confirmed this possibility and outlined certain requirements that have to be met for this purpose such as, agreement to the Cruise by countries in the region; participation of qualified scientists from the region throughout the cruise period; assurance of availability of the data collected to the international community; and provision of some logistical support.

29 The meeting agreed on the modalities for fund raising as outlined in Annex VII.

4.7 CO-ORDINATION

4.7.1 Constitution of Steering Committee and Appointment of a Project Co-ordinator

30 It was agreed that the Steering Committee is formally established and entrusted with Project implementation with the following Terms of Reference:

(i) To advise on scientific and technical matters related to the Integrated Project Plan (IPP) for the coastal and marine environment of the ROPME Sea Area, as developed by the first meeting of the Steering Committee (Kuwait, 24-27 September 1991), in order to achieve its overall objectives.

(ii) To ensure the co-ordination of the Integrated Project Plan activities with the relevant projects of ROPME Programme.

(iii) To guide the implementation of the marine and coastal environment component of the UN Interagency Plan of Action entrusted to the IOC in co-operation with other involved bodies, according to the Integrated Project Plan, and as appropriate, liaise and interact with the technical bodies responsible for the implementation of the other components of the Plan of Action.

(iv) To review and update, regularly, the implementation plans and its budgetary implications as deemed necessary.

(v) To assist, as far as possible, in fostering national and international support necessary for the execution of the Integrated Project Plan activities.

(vi) To act as a clearing house for the main contributors to the Integrated Project Plan.

(vii) To serve as a forum for consultation and exchange of information relevant to the environmental consequences of the war in the ROPME Region, particularly with respect to the marine and coastal environment; and

(viii) To review, periodically, the progress achieved and problems encountered in the implementation of the activities of the IPP and to report to the co-sponsoring organizations (IOC, ROPME and UNEP) through ROPME Secretariat.

31 It was agreed that the Steering Committee consists of a Chairman, a Project Co-ordinator, representatives of some ROPME Member States, IOC, UNEP and other leading organizations. The Steering Committee shall establish special Task Forces to deal with specific issues as required. Task Forces that need to be immediately established include those on financial resources, data management and the major scientific programmes as specified in 4.7.2. The Project Co-ordinator, who should be a full-time appointee of ROPME, will be in charge of the day-to-day execution of the Integrated Project Plan under the direct supervision and authority of the Co-ordinator (Tech. & Admin.) of ROPME.

32 The meeting recommended that the ROPME Secretariat initiate a regular circular to keep all participants informed of progress in implementation of the Integrated Project Plan.

4.7.2 Implementation

33 Further to the decisions reached at the Paris Meeting in June 1991, the meeting agreed on the following scheme of implementation:

(i) The Immediate (3 months) part of the Integrated Project Plan (Annex VIII). The coastal elements of the Plan should commence immediately in those countries where they are not already in progress.

The marine component would start about the end of October 1991 possibly utilizing a research vessel, such as "Mukhtabar Albihar" of the University of Qatar.

(ii) The short-term part of the Integrated Project Plan would start in early 1992 pending the availability of the research vessel. It would last approximately 100 days and would aim at a synoptic and, in some aspects, detailed Oceanographic Survey of the ROPME Sea Area with emphasis on those areas which are heavily affected by the recent oil spills (Annex IX).

(iii) The updated Integrated Project Plan is foreseen to be implemented over a two-year period. Some of the elements of this Plan are already in progress. Both the immediate and short-term phases described above constitute elements of the Integrated Project Plan (IPP) (Annex VI).

34 It was agreed that Task Force leaders for the immediate and short-term phases of the Integrated Project Plan and financial resources Task Force will be identified by 4 October 1991.

35 Professor Hassan was selected as the leader of the Task Force for the Immediate part of the Integrated Project Plan. NOAA offered to provide a leader for the Task Force of the short-term part of the Integrated Project Plan, and ROPME offered to provide the leader for the financial resources Task Forces. In addition, it is essential that these Task Forces meet within two weeks of this Meeting.

36 The importance of archiving of samples was also recognized by the meeting.

4.7.3 **Data Management including Storage, Retrieval and Information Exchange**

37 The UNEP Representative introduced the Data Base installed at the ROPME Secretariat under the UN Interagency Plan of Action.

38 Messrs. M.B. de Vries and John Dijkman, Data Management Consultants from the Netherlands made a presentation on the capabilities of the data system. The system is PC- based, single user and developed using DBASE-CLIPPER for the application and is integrated with several powerful commercially available packages (LOTUS, SURFER, ATLAS*GIS, IDRISI, HG). These packages are interrelated using standard data-formats.

39 The meeting emphasized the importance of inputing data into the system as soon as possible from the ROPME Region as well as other data sources. The Meeting stressed that all concerned agencies and organizations be requested to make available all data relevant to the Region required for the projects to be undertaken by ROPME. To ensure communication of the system with regional and international institutions, establishment and implementation of electronic mail facility was also recommended.

40 It was pointed out that the existence of International Oceanographic Data Exchange (IODE) programme of IOC should be taken into account by ROPME.

4.8 TIMETABLE INCLUDING FUTURE TRENDS

41 It was agreed that the timetable for project implementation should be as described under Agenda Item 4.7.2.

5. PREPARATION OF DRAFT REPORT

42 A draft report was prepared and presented to the meeting.

6. ADOPTION OF THE DRAFT REPORT

43 The Draft Report was reviewed and adopted by the meeting.

7. CLOSURE OF THE MEETING

44 The Chairman, Dr. Nizar Tawfiq thanked all participants for their valuable contributions to the success of the meeting and expressed gratitude to H.E. Dr. Abdul Rahman Al-Awadi, Executive Secretary of ROPME for his personal attention to the meeting and valuable guidance. Sincere thanks were expressed to the ROPME Secretariat and in particular the Co-ordinator (Tech. & Admin.) Dr. Badria Al-Awadi for the excellent facilities provided for the meeting.

45 Both Dr. John Knauss and Dr. Abdul Rahman Al-Awadi congratulated the Chairman for steering the meeting to a productive end. H.E. Dr. Al-Awadi praised the dedication of the participants and pledged the determination of ROPME to work for the full implementation of the Updated Integrated Project Plan agreed at this meeting.

46 Dr. Abdul Rahman Al-Awadi, requested the IOC representative, Dr. Chidi Ibe to convey to the IOC Secretary, Dr. Gunnar Kullenberg, his deep appreciation of the initiatives taken by IOC in arranging both the 12-14 June 1991 Meeting in Paris and in collaborating with ROPME and UNEP in organizing the present Meeting in Kuwait. He said the coastal and marine environment of the ROPME Region has been disrupted and injured and that he was full of hope that the implementation of the Integrated Project Plan would lead to the ultimate recovery of the coastal and marine environment.

47 In the absence of any other business, the Chairman declared the meeting closed at 8.00 p.m. on 27 September 1991.

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ANNEX II

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ANNEX III

UN INTERAGENCY PLAN OF ACTION ADDRESSING THE ENVIRONMENTAL CONSEQUENCES OF THE ARMED CONFLICT OVER KUWAIT

United Nations Environment Programme

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RESTRICTED

17 September 1991

Original: ENGLISH

ROPME/IOC/UNEP Steering Committee Meeting
on Oceanographic Co-operation in the ROPME Sea Area
Kuwait, 24-26 September 1991

UN INTER-AGENCY PLAN OF ACTION ADDRESSING THE ENVIRONMENTAL CONSEQUENCES OF THE ARMED CONFLICT OVER KUWAIT

paper prepared and presented by
UNEP
Oceans and Coastal Areas, Programme Activity Centre

UN INTER-AGENCY PLAN OF ACTION ADDRESSING THE ENVIRONMENTAL CONSEQUENCES OF THE ARMED CONFLICT OVER KUWAIT

1. INTRODUCTION:

The Second Special Session of the Governing Council of the United Nations Environment Programme (Nairobi, 1-3 August 1990) by its Decision SS II/8 on the situation in the Middle East expressed its concern over the destruction of the environment and disruption of social and economic structures, resulting from the armed conflict over Kuwait.

Pursuant to the above resolution, and with the breaking out of the hostilities in the region, the United Nations Environment Programme took the initiative to intensify co-operation within the UN system to optimize the diverse capabilities of the system to respond rapidly to the resulting environmental crisis and to urgent requests from all Member States, both those who are or could become victims and those who wished to provide assistance.

To set this process in motion, UNEP immediately got in touch with all parties concerned as well as with other UN agencies, especially in the first instance with the International Maritime Organization (IMO), which had already initiated actions to assist the governments of the region in their response to the then reported massive releases of oil into the marine environment of the Sea Area of ROPME, the Regional Organization for the Protection of the Marine Environment.

UNEP, cognizant of the immediate and long-term environmental threats to an ecologically fragile region that supports some ten million people, called for a concerted UN Interagency effort commensurate with the nature and magnitude of the crisis. To this effect, UNEP convened the first UN Interagency Consultation on the environmental consequences of the war in the ROPME region (Geneva, 5-6 February 1991)*.

At the above consultation, the need was recognized for a comprehensive and co-ordinated approach to deal with the potential local and regional environmental and socio-economic consequences of the war, affecting the marine, coastal and terrestrial environments, as well as the atmosphere and human health.

2. THE UN INTER-AGENCY PLAN OF ACTION

In pursuance to the above initiatives, a framework of action was developed by UNEP and presented to the ROPME meeting of technical experts on oil spill (Bahrain, 26-27 February 1991). The meeting recommended that the UNEP framework, together with ROPME's proposal for joint action to combat the oil spill in the region, be the basis for a long-term plan of action for the mitigation and rehabilitation of the environment in the ROPME region.

Subsequently, a UN Interagency Plan of Action was further developed by UNEP in co-operation with ROPME and a number of UN specialized agencies, and was adopted at the second UN Interagency Consultation (Geneva, 15 March 1991)*.

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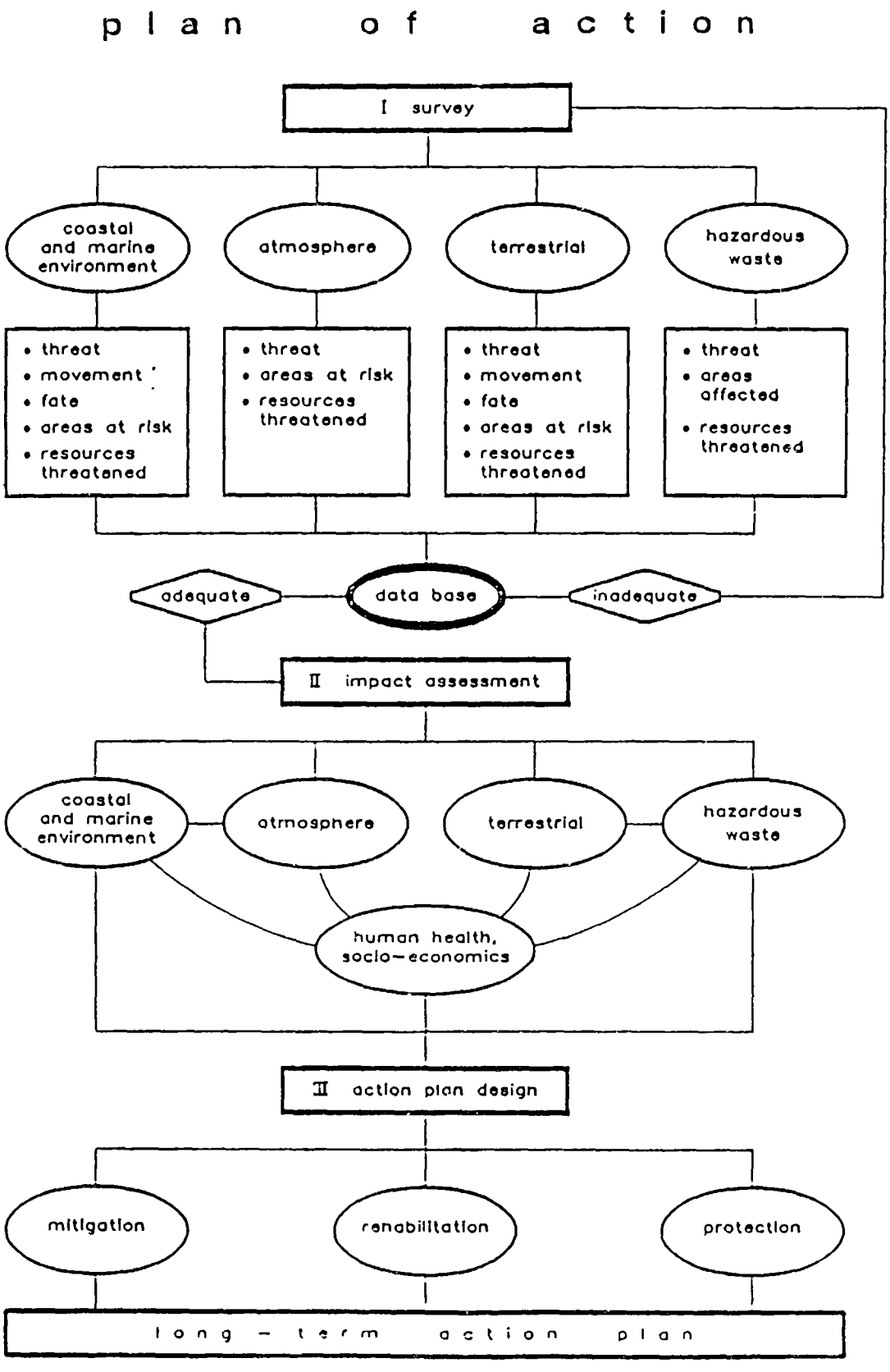
*UN agencies and other bodies represented at the two Geneva UN Inter-agency Consultations were: FAO, IAEA, IMO, IOC/UNESCO, UNCED, UNDP, UNDRO, UNEP, WHO and WMO. The following units within UNEP were represented: the Global Environmental Monitoring System Programme Activity Centre (GEMS/PAC), Industry and Environment Office (IEO), International Register for Potentially Toxic Chemicals Programme Activity Centre (IRPTC/PAC), Co-ordinating Unit for the Mediterranean Action Plan (MEDU) and the Oceans and Coastal Areas Programme Activity Centre OCA/PAC). Other organizations represented were: the World Conservation Union (IUCN) and the Regional Organization for the Protection of the Marine Environment (ROPME). Other UN agencies and organizations invited but unable to attend have been kept up-to-date on the results of the consultation.

Figure 1


plan of action
I survey
coastal and marine environment
atmosphere
terrestrial
hazardous waste
• threat
• movement
• fate
• areas at risk
• resources threatened
• threat
• areas at risk
• resources threatened
• threat
• movement
• fate
• areas at risk
• resources threatened
• threat
• areas affected
• resources threatened
adequate
data base
inadequate
II impact assessment
coastal and marine environment
atmosphere
terrestrial
hazardous waste
human health, socio-economics
III action plan design
mitigation
renabilitation
protection
long - term action plan

The Plan of Action consists of three distinct phases: the survey phase, the assessment phase and the plan design phase. Its focus is on four separate but interlinked areas: the coastal and marine environment, the atmosphere, inland terrestrial areas, and hazardous waste management (Figure 1). Of crucial importance to the success of the Plan of Action is the establishment of a multi-disciplinary data-base, the objective of which are (a) to permit assessment of the adequacy of the data available to support the development of effective implementation plans; (b) to enable the assessment of the impacts in the four areas of activities; and (c) to assess the requirements for the design of implementation plans

The activities envisaged under the UN Inter-agency Plan of Action cover a wide range of environmental aspects related to the aforementioned areas. In the general framework of the Plan of Action, each of the co-operating agencies is responsible for the implementation of the component(s) of the Plan of Action relevant to its specific mandate. However, all agencies are working in concert in order to ensure the maximum coherence of results and recommendations, particularly with regard to the mitigation and rehabilitation programme to be proposed to the governments of the region through their regional body, ROPME.

The distribution of responsibilities amongst the agencies co-operating in the Plan of Action is shown in Table (1) below.

3. CO-ORDINATION AND IMPLEMENTATION OF THE PLAN OF ACTION

The activities of the Plan of Action described above are being carried out under UNEP's overall co-ordination, in close collaboration with ROPME and are being implemented by the responsible agencies and organizations in co-operation with the governments of the region, and governments providing assistance. Every effort is being made to build on data and information already generated by teams operating in the area, and on initiatives and actions being undertaken by various agencies, organizations and institutions working in the region.

4. OUTPUTS

The UN Inter-agency Plan of Action is expected to produce the following main results:

(a) Environmental base-line information, including ground and remote sensing data, relevant to the four aspects: marine and coastal, atmospheric, terrestrial, and hazardous wastes.

(b) An assessment of the magnitude of impact on different aspects of the environment and the extent of damage thereof,

(c) Identification of priority areas at risk,

(d) Identification of resources threatened in these areas, and

(e) A detailed proposal for the mitigation and rehabilitation of the impacted areas.

In addition to the above, and as a result of the supporting activities of the Plan of Action, the following important achievements are also expected:

(f) An operational Computerized Data System (CDS) including a multi-disciplinary data-base, established at ROPME Secretariat for use and free access by ROPME Member States/national institutions and all organizations/institutions participating in or contributing to the Plan of Action, and

(g) Personnel/experts from the region trained on:

- operation and maintenance of the CDS and the data-base,
- interpretation and analysis of remote sensing data of the coastal and marine ecosystems.

Table (1)
Activities of the UN Interagency Plan of Action
and the responsible Organizations/agencies
in co-ordination with ROPME

Areas/Activities	Responsibility
a) Coastal and Marine Environment:	
- Oil pollution response and clean-up operations	IMO
- Oil pollution assessment and monitoring, water quality	IOC/IAEA
- Oceanographic observations and Data support	ROPME/IOC
- Coastal/marine ecological assessment	IUCN/WWF/IOC
- Living marine resources	IUCN/FAO/IOC
- Coastal infrastructure	UNCHS (Habitat)
- Remote Sensing/Data-base support	ROPME/UNEP
b) Atmosphere:	
- Air quality/effects on human health	WMO/WHO/IAEA
- Air/Sea exchange	IOC
- Meteorology and long range air pollution transport	WMO
c) Terrestrial:	
- Food, soil, agriculture	FAO/IOC
- Terrestrial ecosystem/desertification	UNEP(ROWA)
- Food safety, drinking water	WHO
- Shelter/Welfare	UNCHS(Habitat)/WHO
d) Hazardous Waste Management	
- Assessment of damage to industrial sector and risk of release of hazardous wastes	UNIDO/WHO/UNCHS
- Industrial Safety	UNEP(IEO)

5. PROGRESS ACHIEVED

Coinciding with both the Second UN Inter-agency Consultation and the Informal Ministerial Consultation held in Nairobi (March 11-13), UNEP's Executive Director established a Special Trust Fund devoted exclusively to the financing of the UN Inter-agency Plan of Action (excepting the activities by IMO which are funded by a pecial IMO Oil Pollution Disaster Fund for ROPME Sea Area). As of August 1, 1991, a total of US$ 2.6 million has been received in the Trust Fund from the governments of Japan, Norway and the Netherlands as follows: Japan (general purpose) US$ 1.11 million, received 26 March 1991; Norway (atmospheric components) US$ 1.0 million, received 1 June 1991; and the Netherlands (computerized data system) US$ 0.5 million, received 1 July 1991. Further funding for the implementation of the Plan of Action and the comprehensive environmental rehabilitation programme would have to be mobilized from funding agencies (e.g. UNDP), donor countries and non-governmental and private institutions.

The following is a brief description of the main achievements of the Plan of Action to date:

A Core Group for the Plan of Action, consisting of a Task Team Leader, a Technical Advisor (expert in Computerized Data Systems), Administrator and three experts from the ROPME region in the fields of marine pollution, atmospheric pollution and remote sensing was established in Kuwait on 24 April, 1991. The Core Group is hosted by ROPME and is based at the offices of the Secretariat of ROPME. The main task of the Core Group is to co-ordinate the activities to be carried out under the UN Inter-agency Plan of Action, and to facilitate the work of experts/consultants assigned by the co-operating agencies to undertake specific tasks in Kuwait in the framework of the Plan of Action.

Under Memoranda of Understanding, agreements were reached with the following co-operating agencies: IOC, WHO, WMO, IAEA, UNCHS (HABITAT) and UNIDO, outlining the areas of co-operation, the co-operative arrangements, responsibilities and terms of reference for each agency. A similar Memorandum of Understanding was signed between UNEP and ROPME.

To date, IOC, WMO, WHO, IAEA, IUCN, WWF, UNEP and UNIDO have sent some 25 experts and consultants to the region either as exploratory and fact-finding missions or for data and information gathering. The Team Leader of the Core Group has been liaising with the UN experts and consultants arriving in Kuwait. The agencies indicated their plans to send a further 10 to 15 experts/ consultants to work on various aspects of the Plan of Action.

In addition, IMO has been sending and will continue to send separately, but in co-ordination with UNEP, several experts to the region to deal with its component of the Plan of Action. UNEP's Ocean and Coastal Areas Programme Activity Centre (OCA/PAC) is receiving regularly, from IMO, Oil Spill Bulletins giving an account of oil spill movement and impacts and of the status of combating activities.

Air pollution in Kuwait has been monitored by various teams at ground level and in upper layers to determine the nature and fate of emissions and levels of contaminants. WMO is the lead agency in this respect and WHO, in co-operation with the Norwegian Institute for Air Research (NILU), is dealing with air-quality measurement and the health-related aspects of air pollution.

Oil pollution in the marine environment of Kuwait and Saudi Arabia and its effect on the coastal and marine ecosystems are now being checked and evaluated, with IOC and IUCN taking the lead role in this respect. In this context, IOC has sent two consultancy missions to the region. IOC also convened the First Meeting of the Working Group on Oceanographic Co-operation in the ROPME Sea Area (Paris, 12-14 June 1991). A Steering Committee was established by IOC and ROPME in co-operation with UNEP to design the operational details of a co-operative project dealing with the marine component of the Plan of Action, under IOC's technical supervision. The first meeting of the Steering Committee will be convened in Kuwait, 24-26 September, 1991.

An agreement was also reached with the Government of Canada concerning the use of an aircraft (Falcon 20) with remote-sensing capabilities to fly over the coast and part of the terrestrial plain of Kuwait and Saudi Arabia (20 hours flight time) to collect and provide high-resolution environmental information. The results of the overflights will be used by all parties involved in the Plan of Action as base-line data. Overflights were completed over Kuwait, Saudi Arabia, Bahrain and Qatar by 31 March, 1991. According to a preliminary report by the Operation Manager of the aircraft, quality data was recorded pertaining to coastal areas and oil fires. The products obtained included 795 MEIS imageries, 219 Infra-red imageries, and 3 VHS Video tapes with low-resolution images recorded during the overflights.

In the meantime, an agreement has been concluded with a Dutch combination of specialized institutions in the Netherlands under the co-ordination, general performance supervision and support of the Netherlands Ministry of Environment, to establish and operate the computerized data system (CDS). The CDS will be able to handle multidisciplinary data entries effectively , and will be freely accessible to all those participating in and contributing to the Plan of Action.

The central part in the set-up of the data-system is a database. The database contains and can receive input of different types of data that can be of different nature. The types of data include sources, fates and effects of pollution, environmental characteristics, environmental conditions like meteorological and oceanographic data and background information like standards and ecotoxicological data. The database also contains meta-information related to the data, such as environmental monitoring campaigns, measuring methods and calibration procedures and references to literature and other databases.

The data-system offers different types of interaction with the user, facilitated by means of a menu shell as a user-friendly interface to the system. Data-entry can be done manually by filling in forms on the screen, and automatically by loading the database from ASCII or dBase files. Data retrieval from separate data tables is possible by means of report functions. Also, a general views procedure is being implemented, enabling relational use of different data tables. For data processing and presentation a number of standard software packages have been included, offering wide range of facilities like statistical analysis, interpolation, graphical display and overlay mapping. A data quality control procedure has been designed and is being implemented.

Data and information provided by the agencies to the Core Group have been compiled by the Technical Advisor for entry into the above computerized data system.

At the third UN Inter-agency Consultation, (Geneva, 3-4 July, 1991), the UN agencies and other co-operating organizations participating or intending to participate in the UN Inter-agency Plan of Action met to review the progress made since the second consultation (Geneva, 15 March 1991).

In reviewing the status of the Plan of Action on the basis of reports submitted and presentations made at the above consultation, it was concluded that considerable progress had been achieved and that the implementation effort was accelerating in spite of severe time and financial constraints. At the consultation it was also noted that the initial survey and preliminary assessment phases are to be terminated formally on 20 July 1991, ie. 90 days after initiation. However, the representatives recognized that a number of activities begun during the 90 days, would continue naturally after 20 July 1991 until their scheduled completion. It was also recognized that an international co-operative follow-up effort would be necessary, covering all areas affected or threatened.

Furthermore, in the context of the UN Inter-agency Plan of Action for the ROPME Region, arrangements are underway to launch a mission to other affected and/or threatened regions to lay the groundwork for the eventual expansion of the inter-agency activities beyond the present concentration areas in Kuwait and Saudi Arabia.

All agencies and organizations presently co-operating in the UN Plan of Action expressed willingness to continue the existing co-operation in any follow-up activities after the completion of the present phase of the Plan of Action.

ANNEX IV

INTEGRATED PROJECT PLAN

Integrated Project Plan
Annex VIII to the Report of the
IOC Working Group on Oceanographic
Co-operation in the ROPME Sea Area
Paris, 12-14 June 1991

INTEGRATED PROJECT PLAN

BACKGROUND

Between 12 and 14 June 1991, IOC organized the first meeting of the Working Group on Oceanographic Co-operation in the ROPME Region in Unesco, Paris. This was pursuant to IOC Resolution XVI/14 which, among other things, instructed the Secretary IOC to take the initiatives in achieving operational co-ordination between agencies/countries/individuals involved in executing the coastal and marine environment components of the United Nations Inter-agency Plan of Action.

An important consideration in convening the meeting was to determine how best to use in the medium and long-term, the intergovernmental co-ordination and clearing house mechanism afforded through the existence of IOC to help secure the relevant input of the expertise and contacts available in the various IOC Programmes. This would minimise duplication of efforts, optimize output within the limited budgets available and ensure that those concerned do not fall over each other in trying to achieve similar goals.

Members of the working group include identified experts from the ROPME Region and contiguous regions, experts from countries/international organisations who have either been involved in combating the oil spill and the burning fires (and the concomitant problems) or have indicated willingness to do so and Agencies (especially UNEP, IUCN and IAEA) which are participating together with IOC in the studies of the "WET" components of the Action Plan. Two other U.N. agencies with overlapping involvements in the United Nations Inter-agency Plan of Action co-ordinated by UNEP (ie. WMO and IMO) sent contributions, in writing to the Meeting.

This Integrated Project Plan is the outcome of the deliberations of the Working Group and integrates elements of existing national plans (mainly those of Saudi Arabia, Kuwait and Qatar) designed to study the effects of the oil spill and the burning oil wells whithin their national boundaries with elements of the IOC strategy of short and long term actions addressing the pollution problem of the region. It also takes into account provisions stated in the IUCN and IAEA work programmes under the United Nations Inter-Agency Action Plan for the ROPME Region.

SCOPE OF WORK AND OBJECTIVES

The Work Plan consists of two main overlapping phases short and long-term and has a region-wide coverage.

SHORT TERM PLAN

This is geared towards gathering such information and data on matters relevant to the pollution problem that are of immediate concern to decision makers and the general public, e.g. safety and protection of seafood resources, drinking water (from desalination plants) and air. Part of its goal

is to ensure quick and appropriate mitigation and/or restoration efforts.

The broad objectives are:

(a) To establish the circulation pattern in the Gulf, particularly in the vincinity of the north western coast and the open sea area extending from the north to the southern approaches of the Strait of Hormuz and in the Strait of Hormuz itself in order to assess the distribution and dispersion of oil related pollutants.

(b) To establish a water stratification pattern in order to determine mixing processes.

(c) Quantify the extent of the oil spill inter-tidally and sub-tidally, particularly with respect to key biological habitats and resources eg.inter-tidal and sub-tidal muddy sediments, sea-grass beds, coral reefs, salt marshes, mangroves and migratory birds.

(d) Assess the levels of petroleum hydrocarbons and trace metals (especially NI,V) in the atmosphere, water column and sediments and biota.

(e) Quantify the immediate and on-going effects of oil-related pollutants through assessment of change in community structure, composition, and other appropriate chemical, biochemical, physical and ecotoxicological studies on surviving habitats and species in the affected grounds especially in fish and shrimp spawning/nursery grounds.

(f) Evaluate atmospheric deposition/fluxes (mainly dry) for combustion products (eg. SO2,NOx, total carbon, elemental carbon as bulk parameters in the atmosphere, as well as petroleum hydrocarbons (aliphatics and aromatics), and use mass balance approaches to determine air/sea interactions particularly evaporation.

LONG-TERM STUDIES

In reality, a long-term study should derive from the results of the short-term study particularly in terms of sites on which such studies should be focused. Longer-term studies should be undertaken for the purpose of fully assessing the extent of environmental injury, evaluating natural recovery processes and improving the scientific basis for future spill response. However, certain known approaches constitute the core elements of such a programme and are defined below:

(a) Establish the circulation pattern for the whole of the Gulf to understand the transport and deposition of pollutants;

(b) Evaluate the residence time of the inner Gulf in order to project rates of build-up of petroleum related pollutants in the water column and bottom sediments.

(c) Develop accurate model for atmospheric deposition and coastal/oceanic circulation, and enhance existing oil spill trajectory models, e.g. the Gulf Slick II for application in future spills.

(d) Establish the ultimate fate of the hydrocarbons and other oil related pollutants both in air and marine environment, including photo-oxidation reactions.

(e) Investigate disappearance of critical habitats as an index of long-term impact;

(f) Determine critical damage indices: disappearance of sensitive species, injury marks on corals, sublethal stress indicators in bivalves and fish and to evaluate recovery rates

(g) Quantify the sources of carbon fixation and flux.

METHODOLOGIES

The methodologies for accomplishing the objectives stated above are fairly established and most have been published under the "Reference Methods for Pollution Studies" series. Some of the methods are mentioned in the appendixes for the disciplinary components of this plan.

Most of the methodologies referred to above include suggestions as to sample collection (including density of sampling and storage prior to analysis). The correct procedures (appropriate statistical methods) must be adopted at the onset of any sampling programme in order to provide sufficient replication whilst avoiding the pitfalls of pseudo-replication. Elaborate sampling schemes (transects and locations) already exist at the national level in some countries and through previous work by IUCN, IAEA and ROPME and should be integrated into the regional sampling network.

It is important that Member States of the region conduct the sampling of their respective offshore areas at the same time so as to provide a coherent time-series for the region as a whole.

TIME FRAME

The short term plan would be executed in about 12 months or more although it is recognized that certain aspects of the plan particularly those dealing with quality of recreational waters, seafood and safety, sea water for the desalination and power plants could be accomplished, sooner than the 12 months. This is both desirable and necessary as it would provide much needed scientific basis for important social, health and economic regulations by decision makers and the adoption of certain precautionary measures by the citizens.

In principle, the long term plan could last "forever" but of course there will be need to set time limits and the Working Group considered that a three to five year period would be adequate in the first instance.

MODALITIES FOR IMPLEMENTATION

The strategy for implementation hinges on the utilisation of existing resources (human, material and financial) in the region to be supplemented by international assistance. The region boasts of high level scientists and some of the research centres (e.g The Research Institute of the King Fahd University for Petroleum and Minerals, Dhahran and the Kuwait Institut of Scientific Research before the war, as well as centres in the Islamic Republic of Iran, as well as universities in Qatar, Oman and UAE) have equipment and research facilities comparable to those in the industrialized world. Such personnel and facilities should constitute the core for implementation of region wide project.

The implication in that regional cooperation is absolutely critical. International support should aim at fostering this regional co-operation while identifying and making good the gaps in men, material and finance required for project implementation. Owing to the intergovernmental nature of the IOC, the Commission has an advantage to play the lead role in stimulating and co-ordinating such international/regional support in concert with relevant UN Agencies and national/regional/international organisations particularly ROPME, NOAA, USEPA, IFREMER, CEDRE, IOCINDIO, etc.

In this regard, the IOC should play a catalytic role to facilitate the long-term goal of a revitalizing regional infrastrucutre and network and co-ordinate the organization of oceanographic cruises and communal research project in the Gulf region at large, along the lines provided in IOC Assembly, Resolution XVI-14.

DATA MANAGEMENT

Data generated as part of this workplan should be quality controlled and adequately stored for easy retrieval by all interested parties.

Although the Inter-agency Action Plan provides for centralised data base management, the Working Group, while endorsing this approach, recommends that technological developments make it relatively easy for each country to additionally have its own data centre. Such centres, in fact, are arlready in existence in Saudi Arabia, the Islamic Republic of Iran and Kuwait.

TRAINING/EDUCATION

In the field of training and education, IOC can provide various possibilities. These include: individual training and group training, in the region or -if needed- elsewhere in a centre with a specific expertise. In such cases, IOC can arrange a contribution to the expenses of the participants and the lecturers.

Specifically, IOC effort would aim at improving capacity in the region for:

(i) handling and maintenance of specific oceanographic instruments;

(ii) management of marine data and information;

(iii) remote sensing of the marine environment.

It is understood that specific requirements exist in the Gulf Region for training/education related to instrumentation and instrument maintenance, handling of marine data and information and Remote Sensing.

Training is also needed both to improve oceanographic research capabilities and enhance spill response expertise.

BUDGET

It is not possible at the moment to give estimates of the costs of the short and long-term plans because the estimated cost of each plan would depend on how many elements are incorporated in each plan and of course on the exact duration of the plan.

Budgeting should form the subject of further work possibly at the level of a small Steering Committee.

APPENDIX A

SUB-GROUP A: CHEMISTRY

1. SUMMARY AND RECOMMENDATIONS OF THE CHEMISTRY SUB-GROUP

The Chemistry Sub-Group:

1) Recognizes the need to address "short" and "longer" term impacts and the need to monitor recovery of the marine environment in the Region.

2) Recommends that previous studies and experience within the Region should be accounted for in designing programmes of work.

3) Agrees that, in hydrocarbon evaluation, a heirarchical scheme of analytical procedures including the enumeration of tar falls, fluorescence spectrophotometry, GC-FID through to GC-MS (as detailed in the revised UNEP/IOC Manual on Monitoring of Petroleum Hydrocarbons in Sediment) should be adopted. The Group also recommended that copies of the Manual should be distributed to the ROPME Member States.

4) Recommends that laboratories in the Region which have the potential to measure relevant contaminants be appraised and then suitably upgraded and provided with training and quality assurance support through international collaboration.

5) On discussing the scientific objectives, recommends that investigations should include:

5.1 integrated chemical and coastal biological studies;

5.2 assessment of biogeochemical changes in oil residues incorporated into sensitive habitats (especially the productive muddy substrates such as mangrove, seagrass, coral reef and mud basin sediments);

5.3 water column contamination evaluation of polluted environments through analyses of filter feeding bivalves and commercial fish and shrimp species;

5.4 assessment of other potentially important pollutants released in increased quantities owing to the destruction of facilities such as sewage treatment, desalination power production and chemical plants;

6) Recommends that urgent effort be directed at identifying resources that can be adapted for use in the oceanographic studies including manned research vessels, coring devices, and other sampling gear.

2. METHODOLOGY

The need to address both short- term impact assessments and longer-term studies was recognized. The analytical methodology must be defined to address questions of biological impact and biogeochemical processes. Thus the hierarchical approach as detailed in the redrafted in the Manual on Monitoring of Petroleum Hydrocarbons in Sediments (UNEP/IOC, 1991) should be adopted. This new manual is an extension of methods specified in ROPME Monitoring Manual (MODPAM) and should be made available for distribution to all participating laboratories. The methods recommended for use in the subprojects discussed below should be extracted from the printed Manual. Thus the details will not be repeated here.

3. PETROLEUM HYDROCARBONS IN SEDIMENTS

Needs for the chemistry program were defined as follows:

In support of the coastal biology studies and to assess the biogeochemical changes in stranded oil over time, sediment samples should be collected, frozen and archived from impacted and reference study sites in accessible critical habitats. These include areas that will retain oil over long time periods (the muddy substrates in mangrove, saltmarsh, seagrass and sub-tidal mud habitats). It also includes other critical habitats such as coral reef sediments. Thought must be given to optimizing spatial coverage in study sites by compositing samples for analysis. Samples can undergo levels of analysis that are relatively inexpensive (UVF) to provide gross estimates of the extent of contamination and to address questions of sampling replication. For the direct assessment of potential toxicity and to address the biogeochemical aspects, a selected subset of samples should be carried through to gc and gc/ms analysis of specific aromatic hydrocarbons as detailed in the UNEP/IOC methods manual. The first samples should be collected as soon as possible.

4. PETROLEUM HYDROCARBONS IN BIOLOGICAL SAMPLES

To address questions on ambient water quality in coastal areas, filter feeding bivalves should be monitored on a regular basis such as quarterly. These analyses will provide a continuous "history of exposure" to organisms living in the water column. In previous monitoring efforts in the Gulf Region, rock oysters and pearl oysters have proven useful. Study areas, where a suitable native population is absent could have transplanted bivalves suspended in the coastal waters.

To address questions of toxic residues in edible species, the following strategy emerges. Fin fishes provide several levels of concern for pollutant exposure in the ROPME Sea area : concentrations of pollutants in edible tissues of concern for human health safety (consumption of seafood), and as a record of exposure history to pollution, especially for fish species which feed and live on soft bottoms (muddy substrates). Trace element analyses for nickel, vanadium, arsenic, copper, lead and mercury should be implemented (and expanded in existing programs) in edible tissues (fillets) in selected sites in impacted (and reference) areas of the ROPME area. Because

of active metabolism in fish and other higher animals, most petroleum components are discharged into the bile.

For relating exposure of fin fishes to petroleum-related aromatic compounds in the marine environment, it is desirable to employ fluorescent aromatic contaminant analyses of bile (collected from the gall bladder) and determination of the levels and activities of mixed function hepatic oxydases. Fluorescent analysis of bile using high-performance liquid chromotography (Krahn et al, 1986) provide a rapid and inexpensive method of screening fishes for exposure to aromatic contaminants. Most fishes process such contaminants and deposit the fluorescent metabolites in the gall bladder within hours of exposure. If necessary, a small percentage (10%) of edible tissue could be analyzed for selected individual parent hydrocarbons by GC/M3 quantification to show presence or absence of such components.

The cytochrome P-450 dependant mixed function oxydase (MFO) enzymatic system is implicated in the degradation of polynuclear aromatic hydrocarbons. Two methods of measuring cytochrome P-450 associated enzymes are the aryl hydrocarbon hydroxylase assay and the ethoxyresorufin - O - deethylase (EROD) assay. These catalytic assays are very sensitive and reproducible but they require extreme care in sample integrity (i.e. storage at -80 C, minimizing degradation during processing). The EROD method (Grzebyk and Galgani, 1991) has been accepted as a reference method by the International Council for the Exploration of the Sea as very simple, efficient, and cost effective. Hundred of samples can be analyzed in a few days.

For crustaceans and molluscs, no bile can be collected for analyses and since metabolic transformations are much slower in these species than in fish, they may be analyzed for parent hydrocarbons using appropriate methods.

5. AIR/SEA EXCHANGES

The need to evaluate atmospheric deposition/fluxes for combustion products and petroleum components is important in the Northern Gulf as a result of burning oil wells. Because of the low precipitation rates, wet deposition can be neglected. Dry deposition will be calculated from atmospheric concentrations and deposition velocities.

The sea-to-air exchange evaporation must be estimated, especially in areas of oil spills.

Comportments to be investigated

Particulate and vapour phase concentrations need to be determined simultaneously to ascertain evaporation and atmospheric deposition. Concentrations will be measured from high-volume sampling either on GF/F filters or quartz fiber filters. Vapour phase compounds can be collected on adsorbants such as foam plugs placed down stream of the filter.

Cascade impactor sampling is also required on a reduced number of samples, to get the particle size distribution of the compounds under investigation, in order to obtain their settling velocities and thus calculate

their deposition on the sea surface. Evaporation fluxes are needed to estimate how much petroleum hydrocarbon is leaving the marine ecosystem.

Microlayer and sub-surface samples should be collected in selected cases in connection with remote sensing data both in natural and polluted slicks. The microlayer is known to affect air/sea exchanges.

Soils where combusted products have deposited can be air transported upon storms or high wind speed. This fraction of the pyrolytic component may have different pathways in the atmosphere and water column than the submicron particles traditionally associated with combustion processes, since it involves coarse particles.

Parameters to be monitored

- SO_2, NO_x, total carbon, elemental carbon, should be measured as bulk parameters in short and long-term studies
- Pilot investigations for the long-term study
- Ni/V ratio will be used as a source indicator for oil.
- Sulfur
- Aliphatic hydrocarbons and polyaromatics plus their photochemical and microbiological degradation products have to be measured since these products can be more carcinogenic than their precursors.
- Volatile hydrocarbons are proposed as a recommendation.

Data needed from other groups

- Local wind data, humidity, temperature, etc.
- Trajectories for regional scale studies
- Wave coverage (or water surface) to assess particulate emissions from the sea surface from sea-salt aerosol formation
- Estimates of the capacity of each well

Sampling sites

- Sampling should be conducted from land-based atmospheric sampling stations at the source. (Warba and Bubian Islands).
- Other potential sites along the coast need to be identified. (Airports, islands and military basis) to look at the impact of the smoke-plume. Dust deposition rates measurements (conducted at
- the airports along the Saudi coast) may be available since 1979.
- Aerosol collection from ship is necessary if we want to assess what actually reaches the sea surface.

For larger-scale transport, sampling should be done from aircraft.

Sampling should be conducted on a daily basis for some parameters such as SO_2, NO_x, and carbon (soot and organic). For the more sophisticated, time-consuming measurements, samples would be taken on a less frequent time scale.

6. ASSESSMENT OF THE IMPACT OF BURNING OIL WELLS IN THE NORTHERN ROPME SEA AREA

The transport and fate of oil components, photo-oxidation products and burn products associated with the burning oil wells in Kuwait play a central role in the impact of this pollution in the Northern ROPME Sea Area. This problem is best addressed by employing a mass balance type model which incorporates estimates of the sources reactions, sinks and ultimate reservoirs. Processes to be investigated included riverine and other coastal inputs, atmospheric deposition, bioaccumulation by organisms, particle transport and flux, and the rates of deposition and *in situ* degradation in sediments. The approach is exemplified by Burns and Saliot (1986). The atmospheric flux rate would be estimated as detailed in Section 5 above.

Additional effort should include measuring the flux of contaminants through the water column in open sea areas and by means of large volume *in situ* sampling of suspended particles in both open sea and near coastal areas. The sea array should be planned to cover the area under the major plumes emanating from the burning wells. The water column flux should then be compared with fluxes to the sediments estimated by the analysis of interfacial and buried sediments. Visiting research vessels would be useful for collecting sediment cases in open sea areas.

It may be possible to differentiate sources of hydrocarbons and oxidation products using a principal component analysis of chemical data which includes the composition of individual aromatic hydrocarbons (parent vs substituted ring structures), the unresolved saturated hydrocarbons characteristic of unburned petroleum residues, the composition of photo-oxidation products, the composition of tri-terpane biomarkers, and the content of nickle and vanadium. Implementation of this sub-program will depend on obtaining sediment traps and *in situ* sampling devices from collaborating scientists.

7. ADDITIONAL CHEMICAL POLLUTION PROBLEMS

To address related pollution problems additional to the spilled oil, two types of sampling are envisioned.

The impact of chlorination on elevated organic content in seawater used in power and desalination plants in the region.

The discharge of detergents and sewage in areas where treatment plants are absent or have been destroyed.

Both of these would require individual efforts geared to the specific problems. They could be included in the relevant coastal assessment plans.

8. LABORATORIES, TRAINING AND INTERNATIONAL COLLABORATION.

There are several laboratories in the region with variable capabilities. These laboratories should be strengthened and upgraded to provide services to satisfy the demand of the voluminous workload required.

The Research Institute of King Fahd University of Petroleum and Minerals in Dahrahn houses an excellent capability with a track record of using sophisticated techniques. At present all samples from the Saudi Arabian waters, as well as from other surrounding areas, are being processes at this Institute. Further support is required to expand existing capability.

In Kuwait, the Ministry of Health's Laboratories are operational. Kuwait Institute for Scientific Research (KISR) has lost all its equipment. Some staff members are available and plan to build up their laboratories.

Other countries in the region have resources that vary in capability. Training is essential to upgrade these laboratories and to support the interlaboratory calibration activity. Previous experience has shown that in-house training using experts from international laboratories joined with short-duration workshops give the best results.

It is therefore recommended that chemical analysis for the coastal monitoring program be performed in the region as much as possible either through contracts with existing facilities and/or through upgrading of existing facilities and provision of extensive training programmes on site.

In order to adequately address the national as well as the regional objectives of the workplan, a dual approach is recommended. National institutes, though the National Focal Points, should receive technical and logistic support to carry out the sampling and analysis programme within their territorial waters. Emphasis would be on the specific problems and needs of the individual country while carrying out the requirements (in terms of numbers of samples, parameters and cost of procedures) of the programme. The regional component involves a joint effort of national institutes in the region, as well as other institutes and international organizations to carry out work in the open sea (i.e., the cruises). This approach has been applied by ROPME in co-ordinating the KAP Monitoring Programme and does not preclude bilateral co-operation in implementing the regional components.

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APPENDIX B

SUB-GROUP B: BIOLOGY

The sub-group concentrated its discussion on the following topics:

1. THE BIOLOGICAL COMPONENTS TO A MONITORING PROGRAMME

There is a spectrum of biological research and monitoring requirements which, at the extreme, can be characterised as follows:

Fundamental, process-oriented studies designed to provide insights into how the Gulf ecosystem works; without this information we can achieve, at best, only a weak predictive capability regarding the response of this system to future pollution incidents.

In this category we would include an evaluation of what biotopes are the critical ones in fixing carbon via photosynthesis (benthic systems, such as sea-grass beds, or benthic micro-algae on mudflats; or pelagic systems via the phytoplankton); what are the key features of carbon flow in the ecosystem, and what are the nodal points that are most vulnerable to anthropogenic disturbance; what are the quantitative relationships between structural (e.g. species diversity; community type) and functional (e.g. production, nutrient flux) features of the key biotopes (coral reefs, seagrass beds, mangrove and salt marsh areas, mud flats and the water column).

Monitoring studies designed to provide an objective assessment (but without predictive capability) of how various parts of the ecosystem have been impacted and to evaluate the recovery from the oil spills.

In the second category (monitoring) we include a number of techniques which are now available for biological effects measurements. In a number of recent studies suites of such techniques have proven to have a sensitivity and robustness (also a generality of application) that recommend them for deployment in the Gulf. For example, biochemical techniques (cytochrome P450, EROD activity sl; cytological techniques using bio-marshes provide information on pathological changes within seeds and tissues (fish and invertebrates). Physiological measurements of growth to quantify the integrated health of organisms; and statistical measures of community structure (benthic and pelagic) to quantify response to, and recovery from, stress).

In addition, methods of stock analysis for commercially important fish species, when coupled with biochemical and pathological monitoring techniques and measures of fecundity and reproductive success, can provide information on impact in species of direct importance to man.

In such studies account must be taken of the contaminating source and the physical properties of the environment which determine the dispersion of the pollutants and for their concentration. Good information exists for the inter-tidal distribution of the oil in the northern Gulf region, but studies

are urgently needed on the sub-tidal, offshore, distribution of the oil, both now and over time (due, perhaps, to remobilisation from the shore-line). We also emphasise the need to measure atmospheric inputs of hydrocarbons (as aerosols, particulates, soot) to the sea-surface microlayer and to the water column, with studies (eg. by sediment trapping) of the subsequent fate of the fallout from the oil fires.

2. SITES FOR BIOLOGICAL ASSESSMENT STUDIES

In selecting sites for study careful attention is necessary to ensure ecological comparability (eg. similar sediment type and salinity regime). It appears likely that such constraints make it unlikely that study sites representing "impacted" and "non-impacted" conditions in the Gulf can now be found. However, an equally viable sampling programme can be established on transects across areas of different degrees of impact, without having to find so-called "clean reference" sites. Some of the currently available statistical techniques of community analysis, for example, use inherent properties of communities (abundance/biomass distributions) to detect degrees of disturbance. These multi-variate techniques have been usefully applied to tropical ecosystems and can be deployed in the Gulf.

We recommend that sampling sites already selected in the ROPME Region be reviewed with the criteria for biological effects measurements in mind, prior to identifying a few selected areas for detailed analysis. Existing sampling schemes (eg. by IUCN) can be used to provide a general oversight of pollution impact and major features of habitat loss. New sites may need to be identified for more detailed biological analysis.

In addition to transects across area of impact, specific sites of special scientific interest need to be identified for detailed monitoring. The "transect" study at the "special sites" study will occasionally be the same (eg. mudflats and seagrass beds), but in other cases they represent different geographical coverage (eg. offshore coral reefs).

With regard to the atmospheric inputs, a wider geographical approach is appropriate. The models of fallout from the oil fires may provide some guidance in selecting a suitable area, but such an area will have to be relatively large (to accomodate spatial heterogeneity in plankton processes) and subjected to frequent surveys except for the benthic systems which may be adequately sampled twice a year.

3. SPECIES AND ECOSYSTEM COMPONENTS

The group identified a working list of species and ecosystem components for study. This includes:

(i) Shrimp and larval stages. These are species of major commercial concern and they can serve as indicators of both benthic and pelagic events. The larvae of the "temporary plankton" may be used to identify effects of warter-borne and atmospheric contaminants. The juveniles and adults are subjected to exposures on the sea bottom.

(ii) Species of flat-fish. Such species are often non-migratory and are directly exposed to contaminants within the sediments. They have proved, in other oil-impacts studies, to be good candidates for biochemical and pathological monitoring.

(iii) Species of reef-fish, particularly of commercial importance, for limited biochemical, physiological (reproductive success) and population analysis.

(iv) Species of bivalve mollusc (eg. the role of the pearl oyster), which are wellknown to be good bioaccumulators of contaminants with readily measured physiological effects.

(v) Species of key conservation interest, eg. turtles and the dugons.

(vi) Soft-sediment benthic communities on the mud flats and sea-grass beds (also the mangroves).

(vii) Coral communities

Individual corals are sensitive to pollution, responding by "bleaching" to various environmental stresses. They are also of course of fundamental value to the Gulf ecosystem. In addition, corals here are known to be very close in their distribution to their thermal tolerance limits (particularly low temperature). Given the predicted reductions in temperature in the region, resulting from the oil fires, we recommend a special study of coral thermal tolerance, limited to measures of genetic similarity with corals further south in the Gulf, and to an analysis of the historical temperature records for the region (to address the question, and predicted temperature changes within or without historical precedents).

(viii) Mangroves

Here also, as with corals, there is a concern that long-term thermal changes in the ecosystem may pose a threat to survival commensurate with the direct effects of the oil spill. Experiments on thermal tolerance should also be carried out with these species and the results used to direct management decisions on clean up. Raised temperatures under beached oil may destroy sea grasses, salt marsh and tidal flat organisms, and such effects should also be monitored.

4. METHODS TO BE EMPLOYED

In much of what we have reported, there is reference to the methods of biological analysis co be employed, eg. habitat surveys, transect studies, techniques of biological effects measurement. We make two further comments here:

(i) It is of the utmost importance that the correct statistical procedures be adopted at the outset, in planning any sampling

programme, in order to provide sufficient replication whilst avoiding the pitfalls of pseudo replication. Appropriate statistical methods are available and should be employed.

(ii) Remote sensing techniques have an important role. Satellite sensing (eg. SPOT) can give coverage to 10m scales and are invaluable in mapping habitat (and oil) distribution and chlorophyll, but they are less able to allow estimates of effects on important primary producers and their consumers. Such techniques should be supplemented with aircraft over-flights to provide smaller scale coverage, and supported by intensive ground truth and algorithm development.

In addition, we are conscious of rapid advances being made in sea-borne remote sensing techniques such as acoustic detection of plankton and sensor technology for nutrients, chlorophyll and productivity. Whereas these procedures may not have immediate relevance to an impact study they may be of fundamental significance to any longer-term oceanographic surveys of the region.

5. RESOURCES

A considerable expertise already exists in the ROPME Region but it will have to be supplemented if a full biological project is to be effected. This can best be achieved by assembling international Task Teams to work in partnership with scientists from the Region in order to transfer relevant technology and training and to put in place this various elements of the biology programme.

Three key areas were identified:

(i) Biological effects monitoring techniques, including biochemical, physiological and community ecology procedures.

(ii) Measures of production and carbon flow in key habitats, particularly the sites of primary production.

(iii) Remote sensing.

These Task Teams would spend periods of up to three weeks in the region with other frequent visits to assist in the development of the project. This effort should be complemented by appointments within the ROPME Region of middle-grade scientists who would be trained by the Task Teams and who would work within them.

6. PRIORITIES

The following priorities were identified:

(i) Quantification of the distribution and concentration of the oil both intertidally and in the nearshore subtidal, and the concentration within edible species.

(ii) The extent of oiling and damage effecting key biological habitats

and resources (e.g. intertidal and subtidal muddy sediments, seagrass beds, coral reefs, salt marshes, mangroves, and migratory birds).

(iii) The effects of atmospheric inputs and oil on shrimps, key fish species, corals and mangroves.

(iv) Quantification of the sources of carbon fixation and flux.

7. INTERACTIONS BETWEEN DISCIPLINES

There is a need for close collaboration between chemists and biologists in identifying contaminated sites and quantifying the levels of hydrocarbons and other pollutants likely to have biological effects.

Consultation with physicists and earth scientists will help to clarify the fate of oil and its constituent products which are likely to affect biological systems.

APPENDIX C

SUB-GROUP C: PHYSICAL/GEOLOGICAL OCEANOGRAPHY

C.1: PHYSICAL OCEANOGRAPHY

1. GENERAL OBJECTIVES

The general objectives of the physical oceanographic programme (nearshore and open water) are as follows:

- To investigate the oceanographic characteristics of the Region.
- To establish the broad circulation pattern of the Region in order to assess distributional and dispersion patterns of pollutants and organisms.
- To establish the residence time of the water of the Region in order to project rates of build-up of pollutants in the water column, especially oil.
- To derive predictive models for the transport and distribution of oil pollution in the Region.
- To investigate oceanography of restricted coastal areas.

2. PARAMETERS AND PRIORITY AREAS

Physical oceanographic parameters, as well as meteorological parameters are necessary not only for the understanding of physical processes, but they are the basis for understanding chemical, biological and geological phenomena.

Because of the presence of pollution now, the priority of the work should be given to the inner ROPME region. This in turn can be considered as two areas, one nearshore and the other is open water.

In both areas physical parameters will be observed. The responsibility, however will lie with different authorities, the nearshore areas will be observed by the adjacent coastal states, while the open water will be observed by multidisciplinary, multinational cruises.

To accomplish this, both the nearshore and the open area cruises will observe the following parameters at appropriate depths.

Air pressure, air temperature, humidity, wind direction and speed, clouds and rain, solar radiation, collection of airborne matter. Satellite and airbourne images of surface temperature, colour, and altimetry (sea surface elevation) waves and sea state. Inside the water column, temperature,

salinity, pH, turbidity, suspended matter, etc., according to agreements with chemists and biologists.

3. IMPACTED COASTAL AREAS

Most of the impacted coastal areas are found in the north-western part of the inner sea area. These coastal areas are known for their irregular morphology and complex dynamic systems. The local conditions influence greatly the distribution of oil. It is recommended at this stage that ROPME encourage the current research programmes carried out in its Member States, and that at a later stage, the results of these research programmes be discussed in a scientific meeting with view of complementing each other research, and gaining a wider understanding of the coastal system in the Region.

It is very desirable that a minimum research programme in coastal oceanography be agreed upon among the various research groups with the help of ROPME in order to guarantee a certain level of results. Member States could exceed this minimum level and develop more ambitious programmes.

4. THE OPEN SEA CRUISES OF THE INNER ROPME SEA AREA

The attached map and list of oceanographic stations present comprehensive programme for winter and summer cruises.

Current meter strings of 2 meters each, recording every hour, should be moored in the circled (O) eight locations in the accompanying map.

Special attention is to be paid to the Strait of Hormuz and the exchange of water across it.

5. STRAIT OF HORMUZ

Special attention is to be paid to the exchange of water across the Strait of Hormuz. The current regime in the Strait is one of the most interesting and least known oceanographic phenomenon. The proposed study requires current moorings for longer periods of time and at different seasons and under different meteorological conditions. Such programme requires the co-operation of bordering states and the support and participation of capable oceanographic institutions from outside ROPME Region.

6. RESOURCES

This plan will not be fully successful without the additional following elements:

1) Trained manpower to operate the equipment;

2) Land-based equipped laboratories;

3) Maintenance and repair workshops;

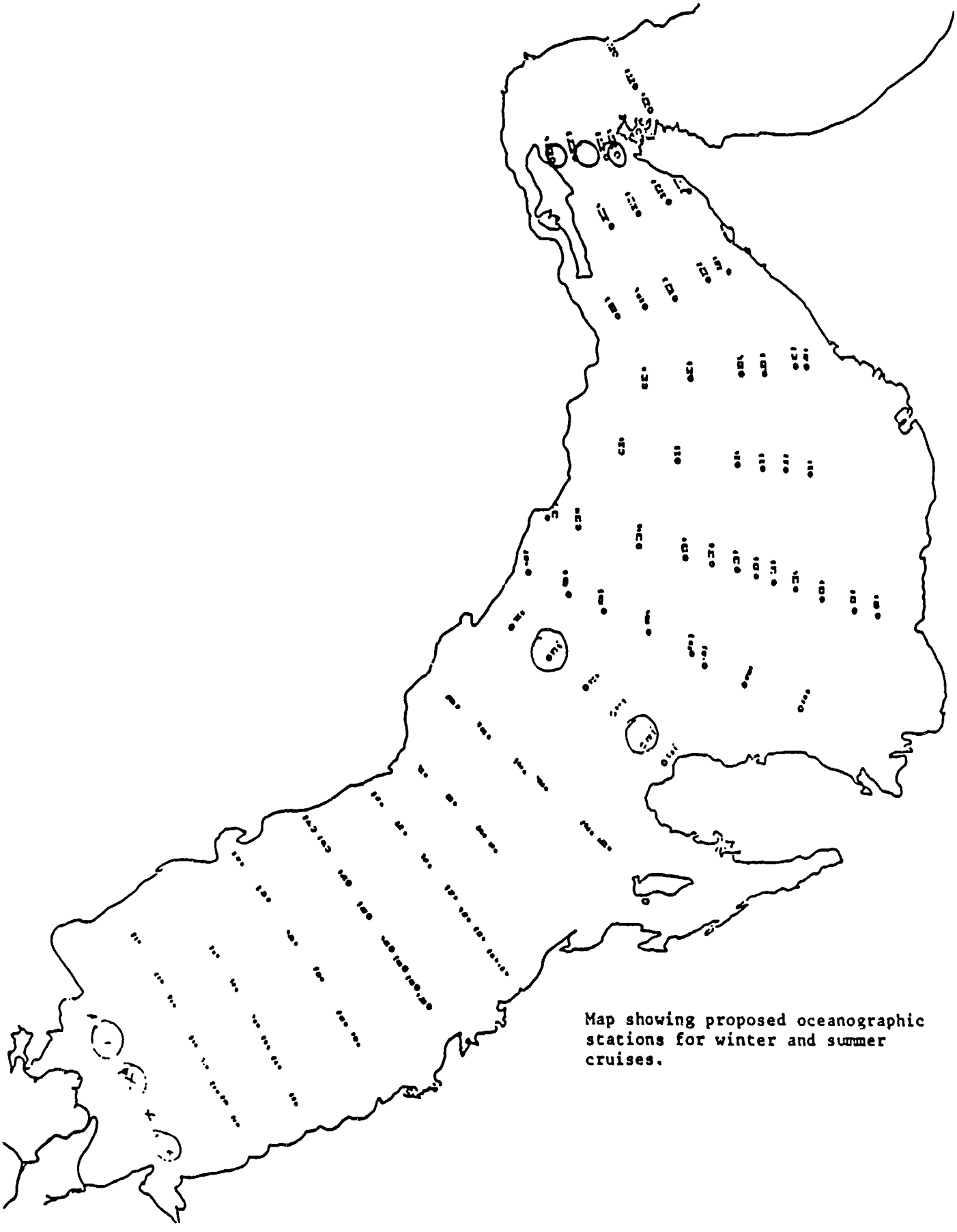
4) Freedom of movement inside the region for scientists and general availability of data for qualified experts.

This programme should be linked and coordinated with other regional and global programmes such as IOCINDIO, WOCE and TOGA and IGBP.

7. BUDGET

The following estimate is given for the proposed cruises only:

30 days x $ 3000 x 2 cruises	= $	180.000/year
Initial cost for current meters 22 x 50	= $	110.000
Initial cost for CTD, etc.	= $	100.000
	$	390.000



Map showing proposed oceanographic stations for winter and summer cruises.

LIST OF OCEANOGRAPHIC STATIONS

Serial No.	Stat.Des.	Latitude (N)	Longitude (E)
1-	I1	28 57.5	48 32.3
2-	I2	29 02.0	48 43.0
3-	I3	29 06.0	48 48.0
4-	I4	29 01.3	48 59.3
5-	I5	29 14.5	49 10.0
6-	I6	29 28.5	49 40.6
7-	I7	29 37.0	49 59.0
8-	I8	29 43.5	50 12.8
9-	II1	28 33.5	48 45.0
10-	II2	28 40.5	49 00.0
11-	II3	28 45.0	49 09.0
12-	II4	28 49.0	49 19.8
13-	II5	28 58.5	49 37.5
14-	II6	29 06.5	49 53.0
15-	III1	28 08.3	49 11.5
16-	III2	28 13.5	49 21.5
17-	III3	28 23.8	49 42.0
18-	III4	28 34.5	50 00.0
19-	III5	28 46.0	50 21.0
20-	III6	28 57.0	50 07.0
21-	IV1	27 39.0	49 30.5
22-	IV2	27 44.3	49 40.0
23-	IV3	27 49.3	49 49.0
24-	IV4	27 55.0	49 59.0
25-	IV5	28 04.0	50 14.0
26-	IV6	28 13.0	50 30.0
27-	IV7	28 22.0	50 46.0
28-	IV8	28 28.0	50 58.0
29-	V1	27 07.0	49 52.0
30-	V2	27 11.3	49 53.8
31-	V3	27 17.3	50 04.0
32-	V4	27 23.0	50 13.5
33-	V5	27 29.0	50 23.5
34-	V6	27 40.0	50 39.0
35-	V7	27 50.0	50 55.0
36-	V8	28 10.0	51 14.0

LIST OF OCEANOGRAPHIC STATIONS (CONT.)

37-	VI1	27 12.0	50 51.0
38-	VI2	27 17.0	50 55.0
39-	VI3	27 30.0	51 10.0
40-	VI4	27 42.0	51 25.0
41-	VII1	26 24.5	50 49.5
42-	VII2	26 31.8	50 58.0
43-	VII3	26 39.5	51 05.8
44-	VII4	26 51.0	51 14.0
45-	VII5	27 00.0	51 26.0
46-	VII6	27 16.0	51 42.0
47-	VII7	27 29.0	51 56.0
48-	VII1'	26 04.0	51 30.0
49-	VII2'	26 10.0	51 40.0
50-	VII3'	26 23.0	51 52.0
51-	VII4'	26 35.0	52 08.0
52-	VII5'	26 53.0	52 20.0
53-	VII6'	27 07.0	52 34.0
54-	VIII1	26 15.0	51 10.0
55-	VIII2	26 23.0	51 10.0
56-	VIII3	26 37.0	51 10.0
57-	VIII4	26 51.0	51 10.0
58-	IX1	24 28.0	52 31
59-	IX2	24 38.0	52 43.8
60-	IX3	24 52.3	52 48.8
61-	IX4	25 04.3	52 53.0
62-	IX5	25 14.5	52 56.0
63-	IX6	25 23.0	52 58.5
64-	IX7	25 30.5	53 01.3
65-	IX8	25 41.0	53 04.3
66-	IX9	25 53.0	53 07.0
67-	IX10	26 13.0	53 13.0
68-	IX11	26 40.0	53 21.0
69-	IX12	26 52.0	53 25.0
70-	X1	24 58.5	53 46.0
71-	X2	25 08.5	53 47.3
72-	X3	25 19.3	53 48.3
73-	X4	25 30.0	53 50.0
74-	X5	25 56.0	53 52.0

LIST OF OCEANOGRAPHIC STATIONS (CONT.)

75-	X6	26 20.0	53 56.0
76-	XI1	25 00.0	54 35.5
77-	XI2	25 09.2	54 34.3
78-	XI3	25 18.2	54 33.0
79-	XI4	25 28.0	54 32.0
80-	XI5	25 50.0	54 30.0
81-	XI6	26 10.0	54 27.0
82-	XII1	25 33.5	55 19.3
83-	XII2	25 43.0	55 15.0
84-	XII3	26 00.0	55 07.0
85-	XII4	26 10.0	55 03.0
86-	XII5	26 22.0	54 59.0
87-	XIII1	25 51.0	55 56.8
88-	XIII2	25 59.8	55 51.3
89-	XIII3	26 13.0	55 46.0
90-	XIII4	26 25.0	55 40.0
91-	XIV1	26 22.5	56 13.0
92-	XIV2	26 27.0	56 11.5
93-	XIV3	26 40.0	56 11.0
94-	XIV4	26 50.0	56 10.0
95-	XV1	26 08.0	56 33.0
96-	XV2	26 10.0	56 40.0
97-	XV3	26 23.0	56 58.5

C.II : GEOLOGICAL OCEANOGRAPHY

1. COASTAL AREAS

1.1 Survey of the intertidal and nearshore subtidal areas including salt marshes, mangrove, to assess the fate of oil pollution.

1.2 Collection of samples for the purpose of chemical analysis to quantify oil-pollutants.

1.3 Establishment of a sediment distribution map describing sediment types, texture and biogenic and non-biogenic constituents to enhance the ecological assessment.

1.4 Assessment of suspended sediment (pluvial and dust-fall out) and its associated pollutants particularly in the northern ROPME Sea Area.

2. METHODS

To achieve the above-mentioned objectives several methods are suggested:

2.1 Aerial photography and remote sensing.

2.2 Surface and sub-surface sediment sampling.

2.3 Reliable navigation system.

For sampling treatment and analysis it is recommended that all concerned institutions and/or agencies take into account MOOPAM.

3. OFFSHORE AREAS

3.1 Survey the sediments of the offshore areas to assess the fate of oil.

3.2 Collection of bottom samples for chemical analysis.

3.3 Constitution of a reconnaissance sediment distribution map, particularly for its western and northern part.

3.4 Update the bathymetric charts, with special reference to the northern area.

4. LONG-TERM PROGRAMME FOR ROPME SEA AREA

4.1 Developing a geo-dynamical regional model.

4.2 Conducting bio-geochemical studies of sediment-water interface.

4.3 Study the impact of the miscellaneous activities (dredging, etc.) on the non-living marine resources.

APPENDIX D

SUB-GROUP D: POLICY AND INTERNATIONAL CO-OPERATION

1. OCEANOGRAPHIC CO-OPERATION AND TIME SCALE

The need for oceanographic cooperation in the ROPME region can be divided into three time frames:

- Emergency
- Short term (for purposes of this work plan, "short-term" is 12 months)
- Long term (for purposes of this work plan, "long-term" is 5 years)

International cooperation for emergency activities is being carried out by IMO and bilateral arrangements.

The IOC should take a leadership role for the short-term and long-term phases of this effort in accordance with the UN Interagency Plan of Action being coordinated by UNEP. The IOC Secretariat should informally coordinate proposed actions with the WMO and WHO, in addition to the formal coordination of related components which is to take place through the UN Interagency Plan of Action.

Information management is one thread that critically links these phases.

Activities should focus on two goals: (i) the effects of the oil spill and burning oil wells on the ecology of the area, and (ii) knowledge that can be gained that will be helpful in addressing future oil spills.

2. POLICY CONSIDERATIONS AND RECOMMENDATIONS

Regional support is critical; international support should be an adjunct to regional cooperation. In the short-term IOC can take a stronger role, analogous to the IMO role in the emergency response portion, to facilitate the long-term goal of a revitalized regional infrastructure and network. Ideally, the region would be able to store, maintain, and share equipment, conduct training programs, etc., through the ROPME Convention and protocols for cooperation, the legal basis established in 1978.

The present environmental response effort, particularly in Saudi Arabia, offers an unprecedented opportunity for accelerating long-term goals-e.g., an expanded data base, training of scientists from the region, provision of technology. The region should move quickly to take advantage of this opportunity. Efforts should build on those pregrams already underway, such as those in Saudi Arabia.

Lessons can be learned for future situations in this region that is particularly vulnerable to oil spills. Cumulative effects of oil spills in the RSA are also not known. There is, in fact, much still to be learned on this subject for all IOC Member states.

Information flow is a problem. There is misinformation concerning the status of adverse effects in the RSA. Attention needs to be given to communications.

Efforts should now focus on waters most heavily impacted, but all ROPME States should have baseline surveys.

IOC can facilitate the establishment of data centers. The regional data base being developed by the UN Interagency Plan of Action can be the starting point, provided that these data can be made freely available. The concept of a centralized data center is, however, no longer required due to advancements in technology and communications whereby each country can conceivably manage its own center, using a common data base. The key issue is availability of high quality data. Data obtained from monitoring programmes must be freely exchanged. In this context, it would be a good start if at one focal point, information would be collected and made freely available concerning past, current and planned marine-related activities in the ROPME region.

IOC advice is needed on the regional oceanographic infrastructure requirements for Kuwait; a mission to Kuwait and other countries is suggested for this purpose.

Training- IOC can facilitate training opportunities, within the framework of its TEMA component, for regional scientists, including on-the-job training in the region. This is probably the best training for long-term needs in the region. Objectives and particular purposes of training should be specified.

ANNEX V

PRIORITIZED ROPME PROGRAMMES

1. INTRODUCTION

This document summarizes the progress and status of implementation of ROPME's programme, particularly the activities related to Marine pollution monitoring and research, since the Seventh Meeting of ROPME Council, held in February 1990 (Due to invasion of Kuwait, ROPME's operations were ceased from Kuwait since 2 August 1990). The individual projects under ROPME Programme have been prioritized to three different categories, to reflect their urgency and importance in view of the present environmental situation in the Sea Area, and their relevance to the UN Inter-agency Plan of Action. Manpower, budget requirements and recommendations are given for review by the ROPME-IOC Steering Committee Meeting.

2. ROPME PROGRAMME

The ROPME Council at its Seventh Meeting (21-22 February 1990), on the recommendation of the Preparatory Meeting, and by its Decision 4.2.1 (ROPME/CM-7/4) approved a number of ongoing projects, and 5 new project proposals, covering a wide range of aspects relevant to the coastal and marine environment of the ROPME Sea Area. These projects are the following:

I. **Projects related to marine pollution monitoring and research:**

1. Marine Monitoring Programme
2. Preparation of a Regional Manual of Plankton Species
3. The Mercury Project
4. Dust Fallout-Associated Pollutants
5. Implementation of the Quality Assurance Project
6. Ecological impacts of oil spills and hazardous materials
7. Network of Tide Gauges in the Region
8. Follow-up of the Impact of sea-level rise on the coastal areas
9. Study of public health related aspects of marine pollution
10. Development of Information System.
11. Specialized Training (Industrial Waste Management; Preparation and evaluation of Environmental Impact Assessment; Coastal Zone Management; and Port/Terminal Inspections)

12. New project proposals:

i. Study of rate of exchange of seawater through the Strait of Hormouz
ii. Open Sea Cruises
iii. Utilization of Remote Sensing Technique in Environmental Assessment
iv. Information on the distribution, taxonomy and ecology of mangroves in the Sea Area
v. Other Programmes
a. Ecosystem analysis of selected habitats such as coral reef and benthic
b. Distribution and ecology of oil degrading micro-organisms

II. **Oil Dispersant Project**

1. Pilot project involving testing the efficiency, biodegradability and toxicity of some dispersants
2. Environmental Sensitivity Mapping

Following the above Council Decision, ROPME Secretariat initiated the necessary steps toward the implementation of some of the projects in co-operation with national institutions in the region and international organizations as appropriate. Table (1) summarizes the state of implementation of these projects as of 1 August 1990.

Given the difficult situation which prevailed in the Region since August 1990, the Organization was not able to initiate but a very few activities. Hence, the implementation of ROPME Programme was severely curtailed.

3. PROGRAMME PRIORITIES

In the light of the present environmental situation in the region on the one hand, and taking into consideration the status of implementation of the various ROPME projects on the other hand, an attempt is made to set up some order of priority for these projects. The criteria for prioritization of a given project were:

(a) The importance of the project with respect to addressing one or more of the environmental problems requiring urgent attention under the present circumstances,

(b) The relevance to one or more of the already initiated activities of the UN Plan of Action, and

(c) The state of implementation of the project in the framework of ROPME programme, which also reflects the amount of investment spent on the project.

The priorities are classified according to the following scale:

I : Projects with the highest priority for implementation,
II : Projects with medium priority,
III: Projects with low priority, could be postponed for the time being.

The results of the above exercise indicate the following:

Priority I (9 Projects):

- Marine pollution monitoring (re-oriented)
- Dust fallout associated pollutants (over sea and land)
- Quality Assurance Programme (re-oriented)
- Ecological impacts of oil spills and other hazardous materials
- Special training (re-oriented)
- Remote sensing
- Toxicity testing of dispersants
- Study of public health related aspects of marine pollution
- Oil degrading micro-organisms

Priority II (8 Projects):

- Mercury project (re-oriented)
- Impact of sea level rise (islands case studies)
- Exchange of water through Strait of Hormouz
- Open Sea Cruise (safety permitting)
- Preparation of guidelines for Environmental sensitivity mapping
- Regional network of tide gauges
- Regional manual of plankton species
- Coral reef and benthos

Priority III (4 Projects):

- Manual of Oceanographic Observations and Pollutants Analyses Methods (MOOPAM)
- ROPME Marine Biological Reference Collection
- Regional Centre for Maintenance and Calibration of oceanographic instruments
- Mangroves in the Sea Area

The above programmes are a part of several other programmes under the four components, i.e. environmental assessment and research; environmental management, development of technical capabilities and environmental law, approved by the ROPME Council in February 1990.

4. FINANCIAL IMPLICATIONS

An estimate of the financial requirements for the first priority projects indicated that approximately KD 259,000 will be the minimum requirement for the implementation of these projects over the period 1991-1992. For second priority projects, the total budget requirements amount to KD 155,500. Breakdown by project is given in Table (2).

Table 1 : Status of Implementation of ROPME Projects/Activities

Programme Projects/Activities as at 7th Council Meeting	Status of Implementation
I. Marine Monitoring & Research Programme	
1. Marine Monitoring Program	Ongoing and successful, the programme was re-oriented to emphasize Oil and Non-oil Pollutants, oceanographic parameters, and the public health aspects; Ad hoc Committee to meet to evaluate data, develop standards, and prepare a summary report.
2. Preparation of a Regional Manual of Plankton Species	Ongoing - The Secretariat has circulated available reports on taxonomy to all NFPs. Qatar is to prepare a study on phytoplankton of Qatari waters in co-operation with UNESCO, ROPME and Qatar University.
3. The Mercury Project	Ongoing and successful, more studies are needed, and establishment of limit values for contaminants in fish, an Ad hoc meeting is to be planned.
4. Dust Fallout Associated Pollutants	Proposal was approved and to be implemented as a part of the re-oriented marine monitoring and research programme.
5. Implementation of the Quality Assurance Project	Ongoing, data not reliable to be re-examined by ROPME. Workshop on regional quality assurance and marine chemistry including analysis of nutrients are needed.

Programme Projects/Activities as at 7th Council Meeting	Status of Implementation
6. Ecological impacts of oil spills and hazardous materials	Not initiated, the scope to include not only oil slicks but also spills of hazardous chemicals and hazardous wastes.
7. Network of Tide Gauges in the Region	Not initiated, ROPME Consultant submitted a report, upon which the requirements for implementation should be based, assistance should be provided to WMO and IOC in consultation with UNESCO/IOC Regional Office, and training of national experts is recommended.
8. Follow-up of the impact of sea-level rise on the coastal areas	First Meeting on implications of climate change in the Region was held in May 1990. Contributors were to submit specific topics on 30 Sept., '90. A second meeting was scheduled for Jan., '91.
9. Study of public health related aspects of marine pollution	Not initiated
10. Development of Information System	Ongoing.

Programme Projects/Activities as at 7th Council Meeting	Status of Implementation
11. Specialized Training	Not initiated, support for international workshop for 2-3 months training period was approved in areas of Industrial Waste Management, evaluation of Environmental Impact Assessment, Coastal Zone Management and Port/ Terminal Inspections.
12. New Project Proposals	
i. Study of rate of Exchange through the Strait of Hormouz	Not initiated, moored current meters are to be installed by 1 or 2 oceanographic centers in co-operation with IOC and other international organizations.
ii. Open Sea Cruise	Not initiated, if funds were available, duration of the cruise should be extended, and the programme should cover the rate of exchange of sea-water through the Straits.
iii. Utilization of Remote Sensing Technique in Environmental Assessment	Not initiated, a meeting/workshop with a training element on the utilization of the technology in marine sciences was recommeded in co-operation with UNEP.

Programme Projects/Activities as at 7th Council Meeting	Status of Implementation
iv. Information on the distribution, taxonomy and ecology of mangroves in the Sea Area	Not initiated, information on distribution, taxonomy and ecology of mangroves to be collected and circulated to Member States.
v. Other Programs	
a. Ecosystem analysis of selected habitats such as coral reef and benthic	Not initiated. A proposal is to be submitted for review by the Task Team of Marine Monitoring and Research Programme.
b. Distribution and ecology of oil degrading micro-organisms	Not initiated. A proposal is to be submitted for review by the Task Team of Marine Monitoring and Research Programme.
II. Oil Dispersants Project	
1. Pilot project involving testing the efficiency, biodegradibility and toxicity of some dispersants	Not initiated, depends on the availability of funds, a testing facility is required.
2. Environmental Sensitivity Mapping	Not initiated, a detailed report is to be submitted for presentation in an Ad hoc Expert Meeting.

TABLE 2 : Minimum Budget for the First and Second Priorities Projects

Projects	Amount (KD)
First Priority :	
1. Marine Pollution Monitoring	65,000
2. Dust Fallout Associated Pollutants (Over sea and land)	24,000
3. Quality Assurance Programme	29,000
4. Ecological impacts of oil spills and hazardous materials	33,000
5. Special Training	20,000
6. Remote Sensing	25,000
7. Oil Dispersants	18,000
8. Study of public health related aspects of marine pollution	29,000
9. Oil degrading micro-organisms	16,000*
Total (A)	259,000
Second Priority:	
1. Mercury project	15,000
2. Impact of sea level rise	7,500
3. Exchange of water through Strait of Hormuz	10,000
4. Open sea cruise	65,000
5. Preparation of guidelines for environmental sensitivity mapping	6,000
6. Regional network of Tide Gauges	22,000
7. Regional manual of Plankton species	20,000
8. Coral reef and benthos	10,000*
Total (B) :	155,500
Grand Total :	414,500

*ROPME Secretariat proposed.

ANNEX VI

UPDATED INTEGRATED PROJECT PLAN

Table of Contents

A. Objectives

1. Develop information required to support immediate clean up and public health decisions or to prevent further damage.

2. Determine damages to natural resources

3. Identify restoration and mitigation opportunities to be undertaken

4. Identify long-term monitoring requirements

5. Develop institutional capacity in region to respond to future spills

6. Add to general scientific knowledge base for future spills

B. Integrated Project Design

PART ONE: Assessment, management and capacity building

I. Assessment of Sources and Transport of Contaminants

A) Sources of oil from 1991 war.

1 Shipping (MEPA)

2 Shoreline facilities and coastal defense trenches (MEPA/UNDP Consultant)

3 Fires
- a. Amount of material entering atmosphere (NOAA, Kuwait)
- b. Location of plume over time (WMO/NOAA)
- c. Deposition (land and sea) IOC Report to UNEP IOC/STEER1/ Appendix D

Note: High priority study because must be carried out before fires are put out.

4 Potential Sources from Sunken ships (ROPME Annex)

5 Potential Future Sources (eg. Terrestrial runoff and Oil Lakes) (Kuwait/ROPME)

B. Distribution and Movement of oil and oil burn products

1. Process Affecting Movement

- a. Circulation in area of spill. (Existing model updated with new information)
- b. Meteorology (MEPA/NOAA)
- c. Sediment Transport Study needs to be designed. (IOC/WGOCR-I/3 rev. Annex VIII page 25)

2. Predicted Movements

- a. Spill Trajectory model projections
- b. Atmospheric Model Predictions of Oil Deposition from Fires (WMO Coordinated effort)

3. Observed Movements of Oil in Water

- a. Remote Sensing
  - 1) Satellite studies
  - 2) SLAR (NOAA to summarize)
- b. Observational Overflights (MEPA/KFUPM, Saudi Aramco). Need to be summarized (KFUPM)

c. Shoreline Survey
1 Kuwait
2 Saudi Arabia (MEPA, KFUPM, IUCN/WWF)
3 Bahrain
4 Qatar
5 Iraq
6 I.R. Iran
7 Oman
8 U.A.E.

(Bahrain, Kuwait, Saudi Arabia qualitatively surveyed IOC Team (O.Linden and A.Jernelow) April, May 1991
Surveyed by A.Thorhaug and O.Oerke
IOC Team in June and July 1991 for Qatar, UAE, Oman, I.R. Iran, Saudi Arabia, Kuwait)

4. Synthesis

II. Assessment of Environmental Damage

A. Baseline (prespill) Descriptions of Resources and Risk including data from remote sensing and maps.

1. Kuwait
2. Saudi Arabia (MEPA,KFUPM, NCWCD, Aramco)
3. Bahrain
4. Qatar
5. Iraq
6. I.R. Iran
7. Oman
8. U.A.E.
9. Regional Synthesis (ROPME/UNEP/IOC)

B. Exposure Assessment

1. Distribution and amounts in various habitats
a. Observation of damaged benthic ecosystems contaminant levels in benthic substrates.
b. (IOC Proposal, Appendix E, KFUPM, IUCN/IAEA, etc.)
c. Impact Assessment
1) Quantification of Disturbances in benthic community composition and function - Investigator to be identified (estimated) IOC Appendix E.
2) Benthic Respiration and Productivity in oiled and unoiled areas. IOC Appendix D (Year 1) + Local support
3) Sublethal Stress in bivalves and fish (IOC Appendix E).
4) Respiration and Productivity in water column (IOC Appendix D Year 1)

5) Bioaccumulation including photo oxidation products
   a. Literature Review
   b. Analysis Investigations of Hypothesized impacts (IOC Appendix D) (MEPA proposal for trace metals need to be expanded to include organics)
6) Toxicity (literature)
7) Fishery Impacts
8) Endangered species and sensitive habitats including coral reefs (Council of Europe, IUCN/WWF, IOC).
9) Human health implications needs identification WHO activity report 3 July, 1991
   Proposal needs to be identified (Exxon Valdez: NOAA/Public Health.
   Literature Review

III. Restoration and Rehabilitation

A. Direct Habitat Restoration of impacted areas. (Council of Europe, IUCN, IOC etc.)

B. Acquisition and Protection of equivalent resources in impacted areas. (CEC/Saudi Project and other Projects)

IV Long Term Monitoring and Research Requirements

A. Oceanography and Meteorology Studies including particulate fallout. (IOC/ STEER-1/ Appendix D) (ROPME Proposals)

B. Coastal Studies
(IOC/STEER-1/Appendix D and E)
(IUCN/IAEA)
(KFUPM)

V . Institution Development and Capacity Building

A. Regional Emergency Response Network (ROPME)

B. Scientific Infrastructure UNESCO

C. Public Information

D. Living Resources and Coastal Zone Management (IOC, UNEP, IUCN, etc.)

E. Data Management and Exchange
   1) Establishment of ROPME Data Base (Database established).
   2) Expansion and exchange. GIS Development.
   3) Continuing Development and Operation.

F. Natural Resource Damage Assessment and Restoration capabilities.

G. Legal Infrastructure

VI. Technical and Administrative Support

A. Logistics (Ships, helicopters, boats, cars, etc.)

B. Data management and maintenance of Data Base

C. Quality Assurance/Quality Control

D. Program Planning and Evaluation

E. Training

PART ONE : BUDGET FOR ASSESSMENT, MANAGEMENT AND CAPACITY BUILDING

	QUARTERS								Required Funding (US$)	Potential Source	Potential Responsible Bodies
	1	2	3	4	5	6	7	8			
I. Sources & Transport of Contaminants											
A. Sources											
1. Shipping	C								1000	MEPA	MEPA
2. Shoreline Facilities	C								1000	MEPA	MEPA
3. Fires											
a. Amount of Oil	C								5000	NOAA/EPC	WMO/EPC
b. Location of plume	A	A	C						30000	KEPC/ NOAA/ DOXAN	KEPC/NOAA/ DOXAN
c. Deposition Study (Land & Sea)	F	A	C						173500	TBT	IOC/ROPME
4. Potential from Sunken ships	C								5000	IMO/ ROPME	ROPME/IMO/ UNEP
5. Potential Future Sources	C								50000	UNEP	UNEP/EIO
B. Distribution & Movement of Oil and oil burn products											
1. Process affecting movement											
a. Circulation	A	C							15000	NOAA	IOC/US Navy/ NOAA
b. Meteorology	A	C							30000	WMO/MEPA NOAA	WMO/MEPA/NOAA

	QUARTERS								Required Funding (US$)	Potential Source	Potential Responsible Bodies
	1	2	3	4	5	6	7	8			
c. Sediment Transport	P	F	F	F	F	A	C		TBD	IOC	IOC
2. Predicticed Movement											
a. Spill Trajectory Model Projects	A	C							40000	MEPA/ NOAA	KFUPM/NOAA/ IOC
b. Atmospheric Model Projects			A	C					50000	WMO	WMO
3. Observed Movement of Oil											
a. Remote Sensing											
1. Satellite	P	C							15000	NOAA/ MEPA	NOAA/KFUPM/ IOC/WMO
2. SLAR	A	C							25000	NOAA	NOAA
b. Observation Overflights	A	C							10000	MEPA	MEPA
4. Integration and Synthesis	A	C							15000	TBD	ROPME
C. Shoreline Survey											
1. Kuwait	F	C							30000	Kuwait/ ROPME	KEPC/KISR/ IOC/UNEP
2. Saudi Arabia	C										
3. Bahrain											
4. Qatar											

	QUARTERS								Required Funding (US$)	Potential Source	Potential Responsible Bodies
	1	2	3	4	5	6	7	8			
5. Iraq											
6. I.R. Iran											
7. Oman											
8. U.A.E.											
II. Assessment of Environmental Damage											IOC/UNEP/ ROPME
A. Baseline Data of Resources At-Risk											
1. Kuwait	A	C								TBD	KEPC
2. Saudi Arabia	A	C								TBD	MEPA
3. Bahrain	A	C								TBD	NFP
4. Qatar	A	C								TBD	NFP
5. Iraq	A	C								TBD	NFP
6. I.R. Iran	A	C								TBD	NFP
7. Oman	A	C								TBD	NFP
8. U.A.E.	A	C								TBD	NFP
9. Regional Synthesis	A	A	C						100000	ROPME/ UNEP	ROPME

	QUARTERS								Required Funding (US$)	Potential Source	Potential Responsible Bodies
	1	2	3	4	5	6	7	8			
B. Exposure Assessment											
1. Distribution and amounts in various habitats											
a) Observation of damaged benthic ecosystem	P	F	C						150000	TBD	ROPME/UNEP/IOC
b) Contaminant levels in benthos impact assessment	F	A	F	A	C				500000		ROPME/IAEA etc.
1. Quantify Benthic Disturbances	P	F	F	A	A	C			200000	TBD	IOC
2. Benthic respiration	P	F	F	F	F	C			150000	TBD	IOC
3. Sub-lethal stress	P	F	F	F	F	C			500000	TBD	IOC
4. Respiration/productivity in Water column	P	F	F	F	F	C			300000	TBD	IOC
5. Bioaccumulation											
a. Literature Review	L								20000	TBD	UNEP/ROPME/IOC
b. Analysis	P	F	A	A	A	C			500000	TBD	IOC/IAEA etc.
6. Toxicity (Literature Reveiw)									20000	TBD	
7. Fishery Impacts	L	A	C						100000	TBD	IUCN/FAO/IOC
8. Endangered species and sensitive habitats	L	A	C						200000	TBD	UNEP/IUCN/WWF/COE/IOC

	QUARTERS								Required Funding (US$)	Potential Source	Potential Responsible Bodies
	1	2	3	4	5	6	7	8			
9. Human Health Implication from Marine sea food web	P	A	C						50000	TBD	WHO/NOAA
III. Restoration and Rehabilation											
A. Direct Restoration	P								TBD	TBD	ROPME/IUCN/ COE/IOC
B. Acquisition of Equivalent Resources,	P								TBD	TBD	ROPME
CEC/Saudi	P								2300000	CEC	CEC/MEPA
IV. Long-Term Monitoring											
A. Oceanography*											
Primary Productivity*	P	F	A	F	A	F	A	F	400000	TBD	IOC/ROPME
Inorganic Carbon Cycle*	P	F	A	F	A	F	A	F	400000	TBD	IOC/ROPME
Ocean Profiling*	P	F	A	F	A	F	A	F	400000	TBD	IOC/ROPME
B. Coastal Studies*	P								TBD	TBD	ROPME/IOC

*Programmes may exceed more than 2 years.

	QUARTERS								Required Funding (US$)	Potential Source	Potential Responsible Bodies
	1	2	3	4	5	6	7	8			
V. Institutional Development and Capacity Building											
A. Regional Emergency Response Network	P								TBD	TBD	ROPME/UNEP
B. Scientific Infrastructure	P								TBD	TBD	ROPME/UNESCO
C. Public Information	P								TBD	TBD	ROPME/UNEP
D. Living Resources and Coastal Zone Management	P								TBD	TBD	ROPME/UNEP
E. Data Management											
1. ROPME Data Base	C								500000	UNEP/ ROPME	ROPME
2. Expansion & Exchange									Continuous	TBD	ROPME/IOC
3. Development & Operations									Continuous	TBD	ROPME
F. Natural Resource Damage Assessment & Restoration	P								TBD	TBD	ROPME/IOC
G. Legal Infrastructure	P								TBD	TBD	ROPME

	QUARTERS								Required Funding (US$)	Potential Source	Potential Responsible Bodies
	1	2	3	4	5	6	7	8			
VI. Technical & Administration											
A. Ships, helicopters, boats, cars, etc.	P								2000000	NOAA/ MEPA	ROPME/IOC
B. Data management & maintenance of Data Base	P								500000	TBD	ROPME/IOC/ UNEP
C. Quality Assurance/Control	P								200000	TBD	ROPME/IOC/ UNEP
D. Program Planning and Evaluation (Dedicated staff)	P								1000000	TBD	ROPME/IOC/ UNEP
E. Training	P								TBD	TBD	ROPME/UNEP/ IOC

Code : P = Planning
L = Literature Review
F = Field Work
C = Completion
A = Analysis
TBD = To be determined
NFP = National Focal Point

PART TWO: Cleanup and wreck/ordnance removal

I. Clean-up and mitigation

A. Oil and Oil burn products
   1 Literature Review of available Techniques
   2 Shorleine Clean up Plan
      a Kuwait
         1) Oil
         2) Mines and Unexploded ordnance
      b Saudi Arabia
         1) Oil (Shoreline Clean up) (Appendix ....)
      c Bahrain
      d Qatar
      e I.R. Iran
      f Iraq
      g Oman
      h U.A.E.

B. Disposal of waste from cleanup activities

C. Monitoring of environmental impacts from cleanup operations.

II. Wreck and ordnance removal

A. Wrecks and unexploded ordnances
   1. Survey
   2. Assessment of types and potential environmental risk of cargo
   3. Preparation of removal/management of wrecks and ordnances.

B. Disposal of removed wrecks, wastes and ordnances

C. Monitoring of environmental impacts of removal operation

PART TWO : BUDGET FOR CLEAN UP AND WRECK/ORDNANCE REMOVAL

	QUARTERS								Required Funding (US$)	Potential Source	Potential Responsible Bodies
	1	2	3	4	5	6	7	8			
I. Cleanup and Mitigation											
A. Oil & Oil Burn Products											
1. Literature review of Techniques	C								10000	TBD	ROPME/IMO
2. Shoreline cleanup Plans											
a. Kuwait	P									TBD	ROPME
1. Oil	P									TBD	ROPME
2. Unexploded Ordnance	P									TBD	ROPME
b. Saudi Arabia	C								459000000	TBD	MEPA
c. Bahrain	P									TBD	ROPME
d. Qatar	P									TBD	ROPME
e. I.R. Iran	P									TBD	ROPME
f. Iraq	P									TBD	ROPME
g. Oman	P									TBD	ROPME
h. U.A.E.	P									TBD	ROPME/IOC

	QUARTERS								Required Funding (US$)	Potential Source	Potential Responsible Bodies
	1	2	3	4	5	6	7	8			
II. Wreck and ordnance removal	P								TBD	TBD	ROPME
A. Survey									TBD	TBD	ROPME/IMO
B. Disposal of removed wrecks, wastes and ordnances	P								TBD	TBD	ROPME
C. Monitoring of environmental impacts of removal operations	P								TBD	TBD	ROPME

Code : P = Planning
L = Literature Review
F = Field Work
C = Completion
A = Analysis
TBD = To be determined
NFP = National Focal Point

ANNEX VII

MODALITIES FOR FUND-RAISING

FINANCIAL RESOURCE STRATEGY

In order to both implement this plan and find the resources for its implementation, it will be necessary to define the specifics of each project included in the IOC Integrated Project Plan as soon as possible. It will be necessary to translate the general guidelines identified by the technical, immediate and open sea cruise Task Forces (See Annexes VIII and IX) into project plans that include, a brief descriptions of project objectives, responsible organizations involved, schedule, required logistics, potential involved personnel, available resources, needed resources and budget. In order to start the process of building these project plans, it is recommended that UNEP, IOC and ROPME transmit the programs described by the Steering Committee subcommittees to their members in order to quickly identify exactly which aspects of the general programs various organizations will undertake with or without funding and which programs they will want to collaborate on if additional funding becomes available. Using this information as an initial poll, it will be possible to identify what can be done in the region, what the international community can contribute at this time, and what remaining resources are necessary.

As soon as this initial poll identifying agencies, their interests and areas of expertise is available, follow-up work must identify lead principal investigators to complete the brief description mentioned above. These individuals should also take the lead, under the guidance of IOC, ROPME and UNEP, to identify and seek additional resources if this is required. At the same time, it would also be useful to define existing related projects and ask that this information be given as stated above (an example 1-page project description and example programme schedule is appended).

At that point, it will be clearer which particular programmes can proceed without financial assistance and which cannot. Of those that need additional resources, it should also be possible to identify if partial funding is available, i.e. a ship may be available if fuel costs can be found, if in-kind assistance is needed, if equipment is needed, or if additional money is needed. With a specific project plan, its needs and possible matching or existing funds, the programme and the principal investigator will be in a better position to seek additional resources.

Even before any of the above work is completed, it is possible to identify organizations that may assist with additional resources. During this process, one goal would be to match the objectives of the programs with those of organizations outside the IOC/ROPME/UNEP family in order to conduct complimentary data collection efforts and/or find partners for the Integrated Project Plan.

The following Provisional Funding Resources Matrix identifies potential organizations/institutions in addition to the members of ROPME, IOC and UNEP that should be approached for contribution to this programme.

PROVISIONAL FUNDING RESOURCES MATRIX

Expertise* Logistics	Equipment	Funds	Services*	
KFUPM/RI	UNEP	Arab Fund	UNEP	IOC (UNESCO)
PACST	UNESCO	GCC	WMO	Oil Co.
UNEP	ROPME	Islamic Bank	WHO	in the
IOC (UNESCO)		KFAS	IOC (UNESCO)	Region
Universities		CEC	ROPME	ROPME
COE		CO		Qatar
ROPME		In'l Oil		University
KISR		Spill Res-		
Qatar		ponse Orga-		
University		nizations		
		Private		
		Enterprises*		
		ROPME		

*Other Universities, Research Institutes and Organizations to be identified

The timing of these tasks must be closely co-ordinated with IOC/ROPME/UNEP schedules. This means that lead individuals must be identified almost immediately (by 15 October 1991). The one-pager project description should be completed by 15 November 1991, and the appropriate Task Forces of the Steering Committee should be directed to meet in order to provide guidance and support. A fund-raising campaign should start now and continue with increased effort until the Integrated Project Plan activities are completed. It is expected that implementation of the cruise portions of this plan cannot proceed without reasonable and immediate commitments for funding (for example, the open sea cruise in early 1992 of the short-term Plan of the Integrated Project Plan cannot occur if funding commitments are not made by 15 November 1991).

It is further recommended that a mechanism be established to accept and manage contributions. Lastly, it is recommended that a Task Forces be established under the Steering Committee to co-ordinate the fund-raising campaign.

EXAMPLE

TITLE: Meteorological Measurements to Support Early Warning System - NOAA

OBJECTIVE:
To provide meteorological data describing flow fields in the region affecting (and as affected by) the oil well fires. Such data are needed (a) to interpret air concentration data collected for human health risk assessment, (b) to develop models of the local, fire-affected wind fields, (c) to quantify human exposure over the period since the fires were lit, and (d) to develop an early-warning system for predicting periods when air concentrations may be unusually high.

RESPONSIBLE ORGANIZATION:
NOAA, Air Resources Laboratory

SCHEDULE:
Selection of sites for the erection of towers took place late in April 1991, in collaboration with Kuwaiti representatives. Appropriate office space and computer accommodations were arranged at the same time. 18 meteorological towers and appropriate sensors are presently in transit, ready for immediate deployment upon receipt in Kuwait. A four-person team is presently in Kuwait, awaiting arrival of the towers. Plans call for tower erection to start about May 1991. The full array of towers is expected to be in place until about 15 July, at which time least ten of the towers will be returned to the US. Selection of which towers are needed to sat the project goals will take place after about 30 days of data are collected.

LOGISTICS REQUIRED:
US military support is required to complete shipment of the equipment to Kuwait. Logistic support for all operations within Kuwait has been offered from Kuwaiti sources.

Military transport of at least ten towers back to the US will be requested for late July, 1991.

IN-COUNTRY PERSONNEL:
NOAA -- William R. Pendergrass III, Jeffrey McQueen, David Auble, and Richard Eckman. Contract support -- Randy White.

INTERNATIONAL COORDINATION:
This project is part of the plan accepted by the WMO Meeting of Experts on the Atmospheric Part of the Joint U.N. Response to the Kuwait Oilfield Fires 27-30 April 1991 (Recommendation 6.1.7 b, g, h, i, 6.2.3 d, 6.4.1.a and 6.4.3 c).

IN-COUNTRY CONTACT:
Representatives of environmental agencies of both the Saudi Arabian and Kuwait governments have requested the implementation of this project as soon as possible.

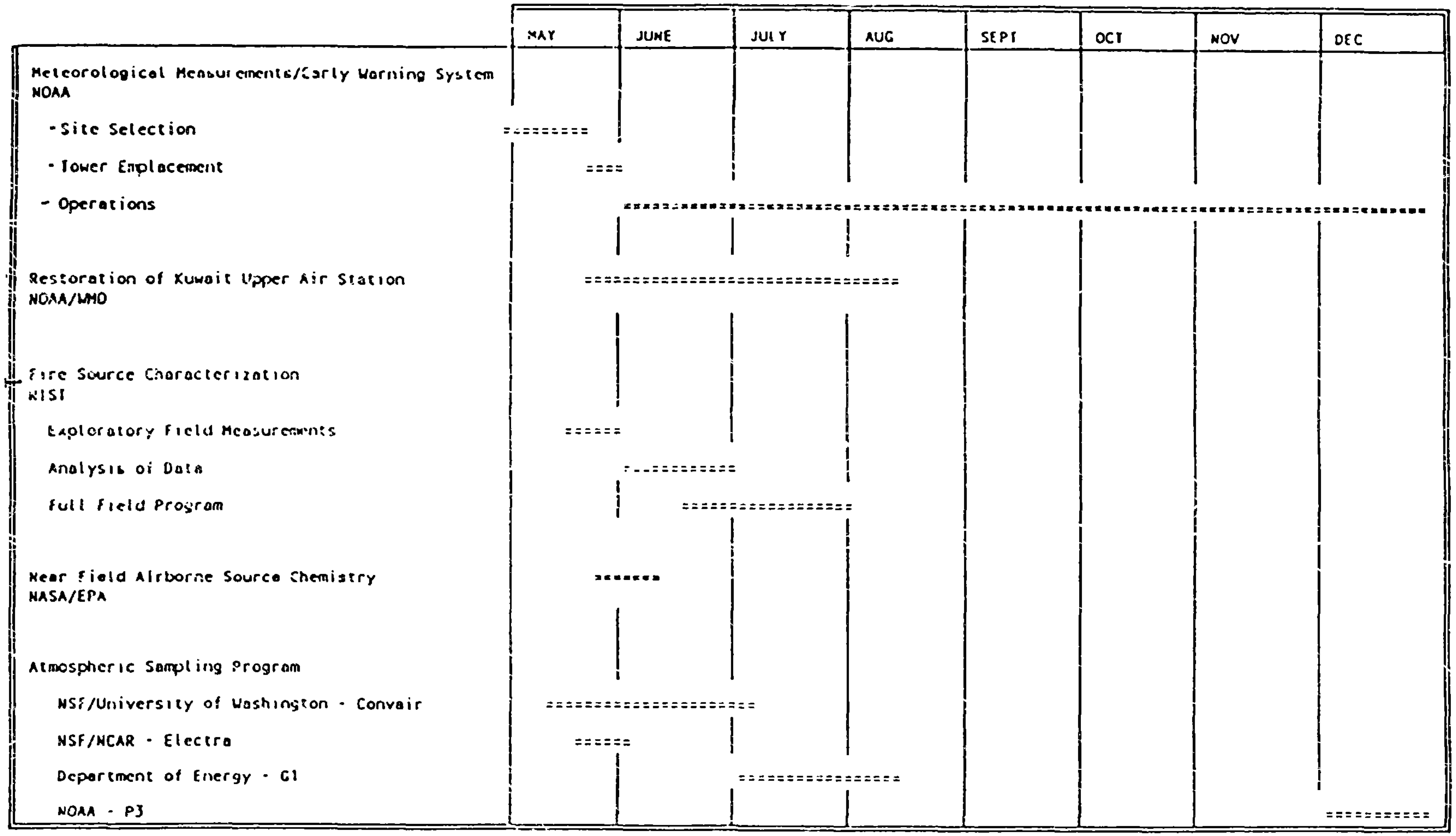
WASHINGTON POINT OF CONTACT:
Bruce B. Hicks, (301) 427 7684.

FUNDING SOURCE:
Primarily NOAA. Initial transportation costs provided by DOD. Supplemental support provided by DNA.

BUDGET:
$ XXX

EXAMPLE

KUWAIT OIL FIRES -- U.S. ATMOSPHERIC PROJECTS



ANNEX VIII

IMMEDIATE (3 MONTHS)
PART OF THE INTEGRATED PROJECT PLAN

IMMEDIATE (3 MONTHS) PART OF THE INTEGRATED PROJECT PLAN

Objectives

1. Information required to give immediate clean up and public health decisions or to prevent further damage.

2. Determine injuries to natural resources

3. Identify restoration and mitigation opportunities to be undertaken

4. Information required to give long-term monitoring requirements

5. Add to general scientific knowledge base for future spills

Rules:

Priority is given to data collection
Member States to cover coastal areas
Ship to cover deep water

Data to be collected:

1. Remote sensed data
2. Meteorological observations
3. Water Samples
4. Biological samples in water
5. Fish
6. Bottom samples
7. Micro surface layer

Means:

1. Remote Sensed data from receiving stations relevent to the area to be submitted to ROPME

2. Small equipped coastal boats (basic equipment: GPS, depth recorder and side looking sonar, portable winch)

3. Small equipped vessel: (basic equipment: Navigational equipment including depth recorder and side sonar)

Equipment:

Meteorological equipments for boats and vessel

Sampling bottles & thermometers (Nansent & Niskin). CTD & portable CTD grabs, gravity corers, plankton nets, turbidity meters, salinometers, oxygen meters, Ph meters, chemicals etc).

Current meters and necessary equipment.

Diving equipment including underwater cameras.

In situ productivity measuring equipment

Personnel:

1. Remote sensing: 1 Manmonth/month to liase with ROPME

2. Meteorological Oberservation : Nothing

3.)
4.) In addition to the regular ROPME program: For small boats: 6
) manmonth/month/6 stations. For ships: 7 manmonths/month (ship
5.) working for 2 months (Scientific complement from all ROPME Member States)

Budget:

1.	Remote sensing	$. 100,000
2.	Meteorological Observation : -	Free of Charge
3.)	Boat for Kuwait	$. 200,000
4.)	G.P.S receivers (8 x 2000)	$. 16,000
5.)	Rental for Vessel (90x3000)	$. 270,000
	Equipment rental (Except ct. meters)	$. 150,000
	Current meter rentals (5x10)	$. 50,000
	Diving equipment	$. 24,000
	Logistic support	$. 40,000
	Nets	$. 10,000
	Productivity	$. 10,000
6.	Micro surface layer studies	$. 75,000
		$. 945,000

No. of coastal sampling stations:		
	Bahrain	4
	Iran	12
	Iraq	4
	Kuwait	6
	Oman	2
	Qatar	4
	Saudi Arabia	12
	U.A.E.	6

Ship: 80 stations 5 anchor stations + mileage
= 35 per cruise + 10 days in Port
= 45 days / cruise

ANNEX IX

SHORT-TERM PART OF THE INTEGRATED PROJECT PLAN

SUB-COMMITTEE ON OPEN SEA CRUISE: SHORT-TERM PART OF THE INTEGRATED PROJECT PLAN

The intention of this project is to use the ship-based survey to obtain a regional synoptic view of oceanographic processes and inter-disciplinary studies that will act as a major synthesis tool to understand recent pollution events, as well as provide a basis for future regional studies in support of ROPME's general long term objectives. In addition, the cruise should provide regional training and informational exchange opportunities.

This cruise program is planned for approximately 100 days duration, comprised of two study approaches. One category is the synoptic oceanographic program which is the mainframe of the cruise. The second includes a series of specialized studies in site-specific locations to evaluate marine impacts of the oil spills, which require appreciable amounts of ship time at the study locations.

Specific studies are suggested in the following 9 areas or disciplines:

1. Synoptic Scale CTD surveys for defining baroclinic structure and water mass analysis.

2. Localized physical process studies to define exchange and sub synoptic scale current patterns in the following areas:

   a) Strait of Hormuz
   b) NW Coast
   c) Mid-Sea Sill
   d) Fresh water sources North-East (region)
   e) Salwa Bay

3. Sediment interface studies, to determine hydrocarbon loading, including

   a) sediment traps
   b) sediment samples and hydrocarbon analysis
   c) Benthic community samples for future analysis
      (need to resolve not question on Bioturbation with reference to sampling plan)

4. Biodegradation studies of hydrocarbon to include benthic sampling and metabolic studies.

5. Sea grass site-specific studies with study sites North of Abuali and control site in the UAE. Study elements will include:

   a) Hydrocarbon deposition
   b) Estimates of Hydrocrabon transport processes
   c) Habitat and community health indices

6. Water column samples for future chemical and biological analysis.

7. Studies of hard bottom coral regions including a dive survey of offshore islands.

8. Collection and analysis of commercial species - shrimp, fish, mollusks

9. Sea bird colony studies to check impact indices.

Cost estimates

Ship costs	2,000,000
Land based project office	250,000
Scientific crew costs	600,000
Project Costs	1,600,000
Initial analysis	1,800,000
Total	6,250,000

* This amount is included in the overall estimated budget for integrated project design.

ANNEX X

LIST OF DOCUMENTS*

* No stocks of the following documents are maintained, except for the Summary Report.

Document Code	Title
WORKING DOCUMENTS	
ROPME-IOC/STEER-I/1	Agenda
ROPME-IOC/STEER-I/2	Annotated Provisional Agenda
ROPME-IOC/STEER-I/3	Summary Report
ROPME-IOC/STEER-I/4	List of Documents
ROPME-IOC/STEER-I/5	List of Participants
ROPME-IOC/STEER-I/6	UN Interagency Plan of Action addressing the Environmental Consequences of the Armed Conflict over Kuwait
ROPME-IOC/STEER-I/7	ROPME Prioritized Programmes
INFORMATION DOCUMENTS	
ROPME-IOC/STEER-I/Inf.1	Working Group on Oceanographic co-operation in the ROPME Sea Area, First Meeting, Paris, 12-14 June 1991 IOC Report No. 65
ROPME-IOC/STEER-I/Inf.2	Report of IOC Mission to the ROPME Area, April/May 1991
ROPME-IOC/STEER-I/Inf.3	Report by Meteorology and Environmental Protection Administration (MEPA) Saudi Arabia
ROPME-IOC/STEER-I/Inf.4	Report by Interagency Mission to Saudi Arabia and Bahrain, May 1991, NOAA, Washington, D.C.
ROPME-IOC/STEER-I/Inf.5	Preliminary Proposal for an Action Plan to Assess the Environmental Impact of the Oil Spills and Oil Well Fires on the ROPME Sea Area