
INTERNATIONAL ATOMIC ENERGY AGENCY
MARINE ENVIRONMENT LABORATORY
MONACO



REPORT TO UNEP

REVIEW OF MARINE POLLUTION MONITORING AND ASSESSMENT IN UNEP'S REGIONAL SEAS PROGRAMMES

STEPHEN DE MORA

**IAEA - MARINE ENVIRONMENT LABORATORY
4, QUAI ANTOINE 1ER
MC 98000 MONACO**

JULY 29, 2004

I Executive Summary

The four key objectives of this report, prepared at the request of the UNEP Regional Seas Programme, are to provide: a quick desktop review of ongoing monitoring and assessment activities in relation to the provisions of all the UNEP Regional Seas Conventions and Action Plans; an assessment on how monitoring and assessment lead to action as defined in the Conventions and their Protocols; suggestions for a realistic and focussed strategy for monitoring and assessment in support of policies and actions of Regional Seas; and recommendations for funding strategies. Insofar as possible, it was requested that the Internet be used to access information about UNEP Conventions and their Protocols. Although the text for all Conventions, together with their additional Protocols, and the Action Plans are available on the Internet, this approach was not feasible for obtaining current information about monitoring and assessment of marine pollution. Such details were requested directly from the Programme Coordinators.

The intent of the Conventions and Action Plans is to harness and co-ordinate national monitoring efforts, preferably in co-operation with international bodies, and include areas outside national jurisdiction. Monitoring requires common procedures and standards, including intercalibration, with a view to ensuring regional and international compatibility of results. However, the Contracting Parties to the various Conventions, Protocols and Action Plans have generally failed to discharge their responsibilities as agreed in the various instruments. There is no clear evidence of a viable regional monitoring and assessment programme operating in a UNEP Regional Seas Programme, with the exception of the MED POL programme.

The Conventions generally have a similar feedback mechanism for results of monitoring to be evaluated by the Contracting Parties, which could then lead to policy changes and new Protocols. Firstly, data exchange is explicitly required, and monitoring is meant to strive for uniformity of effort throughout the region. Recognition of the importance of research indicates that the overall system is meant to be dynamic, with a view to providing an early warning system for initially unrecognised threats to the marine environment. This notion is reinforced in that meetings of Contracting Parties may set up working groups to investigate any matter of concern to the Convention. The reporting process ultimately leads to the Contracting Parties, who are meant to review periodically the state of the marine environment. Further action to be taken to protect the marine environment is thus contingent upon scientific information being reported to the meetings of Contracting Parties.

Although a universally applicable regional monitoring programme cannot be formulated, several guidelines can be provided describing the general features to be incorporated into a regional monitoring programme (RMP). Environmental monitoring is necessary to evaluate the efficacy of the policies laid out in the Conventions and Action Plans. The key parameters in a given RMP should be chosen to address the most important regional problems in the marine environment. The RMP should be flexible and modular, starting with a limited number of parameters, which can be revised and augmented in time to respond to changing regional priorities and emerging pollution issues. A harmonised data set requires agreement on aspects of methodologies and a Data Quality Assurance programme. A consistent reporting format will allow results to create a regional database. The five steps required to establish a RMP of benefit to the Contracting Parties are: defining problems and parameters, network building for monitoring and data exchange, implementation of the RMP, review and evaluation of the environmental data, and reporting to the meeting of Contracting Parties.

In summary, the Conventions provide a framework for countries to work together to protect the marine environment on a regional basis. The role of the Regional Coordinating Unit is to facilitate regional cooperation, ensure data sharing, provide regional assessments, and to advise the meetings of the Contracting parties on the need for further action to protect the marine environment. The underlying mechanism relies on national efforts and, by implication, national commitments to long-term financial support for the monitoring and assessment activities as stipulated in the Conventions.

With respect to financial considerations, adequate funding must be allocated to support operational activities at three levels, namely nationally, regionally and globally. National monitoring is the fiscal responsibility of individual countries. Whereas donors may help set up monitoring programmes, operating costs soon devolve to the country. The Regional Coordinating Units require financial support from their Contracting parties, and should also solicit external funding. In addition the UNEP Regional Seas Coordinating Office should assist to mobilise external funds. The Regional Seas Coordinating Office should facilitate communications between UNEP Division of Global Environment Facility Coordination (DGEF) and the RSPs, both individually and collectively, in developing GEF project proposals in coastal marine environments.

II Recommendations

Ongoing Monitoring and Assessment Activities in Relation to Regional Seas Conventions

1. Contracting Parties should establish the long-term national monitoring programmes that are required to fulfil their obligations as stipulated in the Conventions.
2. Contracting Parties should be urged to coordinate national monitoring programmes, in association with competent international organisations as appropriate, in order to comply with obligations explicit in the Conventions and Action Plans.
3. Contracting Parties should be urged to ratify Protocols that have not yet come into force and in the meantime should be encouraged to comply with the concomitant monitoring and reporting requirements.

Monitoring and Assessment Leading to Action in Regional Seas Conventions

4. Contracting Parties should be urged to undertake a review of the state of the environment in their Convention area.

Strategy for a Regional Monitoring Programme

5. The following five steps should be considered in establishing a regional monitoring programme of benefit to the Contracting Parties:
 - defining regional marine problems and parameters
 - network building for monitoring and data exchange
 - quality-assured pollutant measurements through the implementation of the RMP
 - review and evaluation of the RMP and assessment of marine pollution
 - reporting to the meeting of Contracting Parties

Financial Support for Regional Monitoring Programmes

6. Adequate funding must be allocated to support monitoring and assessment activities at three levels, namely nationally, regionally and globally.
7. UNEP should continue to host an annual Global Meeting of the Regional Seas Programmes and Action Plans in recognition of its value in facilitating communications among RSPs, and between RSPs and Secretariats for other Conventions and UNEP divisions.
8. The UNEP Regional Seas Coordinating Office should facilitate communications between UNEP DGEF and the RSPs, both individually and collectively, in order to promote RSPs as a means to execute GEF projects in coastal marine environments.

III Table of Contents

I	EXECUTIVE SUMMARY	I
II	RECOMMENDATIONS.....	III
III	TABLE OF CONTENTS	IV
IV	LIST OF FIGURES	V
V	LIST OF TABLES	V
VI	LIST OF ACRONYMS	VI
1	INTRODUCTION.....	1
1.1	SCOPE OF THE REVIEW	1
1.2	MONITORING AND ASSESSMENT OF MARINE POLLUTION	1
2	MONITORING REQUIREMENTS IN UNEP CONVENTIONS AND ACTION PLANS	4
2.1	BARCELONA CONVENTION.....	4
2.2	CARTAGENA CONVENTION	5
2.3	ABIDJAN CONVENTION	5
2.4	NAIROBI CONVENTION.....	6
2.5	EASAP.....	6
2.6	NOWPAP.....	7
2.7	OVERVIEW	8
3	ONGOING REGIONAL MONITORING AND ASSESSMENT WITHIN REGIONAL SEAS PROGRAMMES.....	10
3.1	BARCELONA CONVENTION.....	10
3.2	CARTAGENA CONVENTION	12
3.3	ABIDJAN CONVENTION	12
3.4	NAIROBI CONVENTION.....	12
3.5	EASAP.....	13
3.6	NOWPAP.....	14
3.7	OVERVIEW	15
4	THE FEEDBACK LOOP FROM MONITORING TO CONVENTIONS	16
5	A STRATEGY FOR A REGIONAL MONITORING PROGRAMME	18
5.1	CONCEPTUAL FRAMEWORK	18
5.2	PROBLEMS AND PARAMETERS	19
5.3	DATA QUALITY ASSURANCE	21
5.4	DEVELOPMENT AND IMPLEMENTATION	23
5.4.1	<i>Defining Problems and Parameters.....</i>	<i>23</i>
5.4.2	<i>Network Building.....</i>	<i>26</i>
5.4.3	<i>Implementation of RMP</i>	<i>26</i>
5.4.4	<i>Review and Evaluation.....</i>	<i>26</i>
5.4.5	<i>Reporting to Contracting Parties.....</i>	<i>27</i>
6	FINANCIAL CONSIDERATIONS	28
7	CONCLUSIONS AND RECOMMENDATIONS.....	30

7.1	ONGOING MONITORING AND ASSESSMENT IN RELATION TO REGIONAL SEAS CONVENTIONS	30
7.2	MONITORING AND ASSESSMENT LEADING TO ACTION IN REGIONAL SEAS CONVENTIONS	30
7.3	STRATEGY FOR A REGIONAL MONITORING PROGRAMME	30
7.4	FINANCIAL SUPPORT FOR REGIONAL MONITORING PROGRAMMES	31
8	REFERENCES.....	32
	ANNEX I.....	33
	TERMS OF THE REVIEW OF MARINE POLLUTION MONITORING AND ASSESSMENT IN UNEP'S REGIONAL SEAS PROGRAMMES	33
	ANNEX II.....	36
	QUESTIONNAIRE TO UNEP'S REGIONAL SEAS PROGRAMMES	36

IV List of Figures

FIGURE 1	POTENTIAL USES OF RSP DATABASES AT REGIONAL AND GLOBAL LEVELS	3
FIGURE 2	COMPARISON OF THE SCIENTIFIC METHOD WITH A FRAMEWORK FOR ENVIRONMENTAL PROTECTION.....	18
FIGURE 3	NATIONAL (DESIGNATED BY A, B, C & D) AND REGIONAL MONITORING PROGRAMMES	21
FIGURE 4	THIS MODEL SHOWS THE TREND FOR RELATIVE CONCENTRATIONS BASED ON AN INITIAL CONCENTRATION OF 100%, WITH A STANDARD DEVIATION OF 10% FOR 5 SAMPLES, ASSUMING A CHANGE IN THE MEAN VALUE OF 5% PER YEAR. THE BARS AND WHISKERS SHOW THE MEAN VALUE \pm 95% CONFIDENCE INTERVAL. THE HORIZONTAL LINE HIGHLIGHTS THE INITIAL MEAN CONCENTRATION MINUS THE 95% CONFIDENTIAL INTERVAL.....	22
FIGURE 5	THIS FIGURE SHOWS THE NUMBER OF YEARS REQUIRED BEFORE A DIFFERENCE IN POLLUTANT CONCENTRATION CAN BE RECOGNISED AT THE 95% CONFIDENCE LEVEL AT A GIVEN SITE OR SET OF SITES, ASSUMING A DECREASE IN THE MEAN CONCENTRATION OF 5% PER ANNUM, DEPENDING ON THE NUMBER OF SAMPLES ANALYSED AND THE RELATIVE STANDARD DEVIATION OF THE MEASUREMENTS.....	23

V List of Tables

TABLE 1	MONITORING AND STUDY OF MARINE POLLUTION.....	2
TABLE 2	MONITORING ACTIVITIES IN CONVENTIONS AND ACTION PLANS.....	9
TABLE 3	MED POL TRENDS AND STATE MONITORING PROGRAMMES.....	11
TABLE 4	THE MOST SERIOUS PROBLEMS FACING THE MARINE ENVIRONMENT (GESAMP, 2001)	19
TABLE 5	PARAMETERS TO BE MEASURED IN A REGIONAL MONITORING PROGRAMME	20
TABLE 6	DEVELOPMENT AND IMPLEMENTATION OF A REGIONAL MONITORING PROGRAMME ...	24

VI List of Acronyms

AP	Action Plan
BAC	Bacteriological Parameters
BIO	Biota
BOD	5-Day Biochemical Oxygen Demand
BOP	Basic Oceanographic Parameters (depth, temperature, salinity, dissolved oxygen)
CAP	Caribbean Action Plan
CEP	Caribbean Environment Programme
C-GTOS	Coastal Global Terrestrial Observing System
COD	Chemical Oxygen Demand
DGEF	Division of Global Environment Facility Coordination, UNEP
EAAP	Eastern African Action Plan
EAF	Eastern African Region
EASAP	East Asian Seas Action Plan
FAO	Food and Agriculture Organization
GEF	Global Environment Facility
GOOS	Global Ocean Observing System
HAB	Harmful Algal Bloom
HH	Halogenated Hydrocarbons
IAEA	International Atomic Energy Agency
IOC	Intergovernmental Oceanographic Commission
IW	International Waters
MAP	Mediterranean Action Plan
MEL	Marine Environment Laboratory
MESL	Marine Environmental Studies Laboratory
NOWPAP	Northwest Pacific Action Plan
NUT	Nutrients
PAH	Polycyclic Aromatic Hydrocarbon
PCBs	Polychlorinated Biphenyls
PCPs	Personal Care Products
POPs	Persistent Organic Pollutants
PTS	Persistent Toxic Substances
PM	Particulate Matter
RAMP	Rapid Assessment of Marine Pollution
RCU	Regional Co-ordinating Unit
RMP	Regional Monitoring Programme
RSP	Regional Seas Programmes
SED	Sediments
SIDA	Swedish International Development Agency
SIDS	Small Island Developing States
TM	Trace Metals
TSS	Total Suspended Sediments
UNEP	United Nations Environment Programme
UNF	United Nations Foundation
WACAF	West and Central African Region
WAT	Water (sea water)

1 Introduction

1.1 Scope of the Review

This report was prepared at the request of the UNEP Regional Seas Programme (UNEP-RSP). The basis of the request was the acknowledgement that IAEA-MESL has for many years assisted a number of UNEP Regional Seas Programmes and other regional organisations. MESL has provided technical assistance with respect to underpinning marine analytical chemistry. Also, support to regional monitoring has covered all aspects from initial network design through sample collection and analysis to the assessment of marine pollution.

The terms of the review of marine pollution monitoring and assessment in UNEP's Regional Seas Programmes are given in Annex I. The four key objectives were to provide:

- i) A quick desktop review of ongoing monitoring and assessment activities in relation to the provisions of all the Regional Seas Conventions;
- ii) An appraisal of how monitoring and assessment lead to action as defined in the Conventions and their Protocols;
- iii) Suggestions for a realistic and focussed strategy for monitoring and assessment in support of policies and actions of Regional Seas; and
- iv) Recommendations for funding strategies.

This report focuses on the six UNEP Regional Seas Programmes from the following areas: East Asian Seas, Eastern Africa, Mediterranean Sea, Northwest Pacific Ocean, West & Central Africa, and the Wider Caribbean. Despite this limited coverage, the recommendations would be generally applicable to monitoring programmes under the auspices of other regional organisations.

Insofar as possible, it was requested that the Internet be used to access information about UNEP Conventions and their Protocols. Although the text for all Conventions, together with their additional Protocols, and the Action Plans are available on the Internet, this approach was not feasible for obtaining current information about monitoring and assessment of marine pollution. Accordingly, the Programme Coordinators were sent a questionnaire (see Annex II).

A draft report was prepared for presentation at the 5th Global Meeting of the UNEP Regional Seas Conventions and Action Plans in Nairobi, Kenya, 25-27 November 2003. Discussions at the meeting and additional subsequent contributions from Programme Coordinators were taken into account in producing the final report.

1.2 Monitoring and Assessment of Marine Pollution

Several of the UNEP RSPs have adopted the same definition of pollution, namely 'the introduction by man, directly or indirectly, of substances or energy in the marine environment resulting in such deleterious effects as harm to living organisms, hazards to human health,

hindrance to marine activities including fishing, impairment of quality of use of sea water and reduction of amenities’.

Marine monitoring and assessment comprises several different types of activities as outlined in Table 1. The choice of the activity depends upon the purpose of the monitoring. Thus, the key is to generate results that are “fit for purpose”. A holistic view from the outset of establishing a monitoring and assessment programme may subsequently permit a much broader application of the results and data than had been originally intended. Another consideration from the outset is the time scale involved, because some information can only be obtained following long-term measurement campaigns.

Table 1 Monitoring and Study of Marine Pollution

Activity	Potential Applications
Synoptic Survey	<ul style="list-style-type: none"> • Contaminant Screening • Hot spot identification • RAMP techniques • State of the environment (“snapshot”)
Ambient Monitoring	<ul style="list-style-type: none"> • State of the environment • Trend analysis • Transboundary diagnostic analysis
Biological effects	<ul style="list-style-type: none"> • Biochemical responses • RAMP techniques
Compliance Monitoring	<ul style="list-style-type: none"> • End of pipe measurements • Emission inventories
Research	<ul style="list-style-type: none"> • Pollution history • Emerging pollutants • Special case studies

Synoptic surveys can provide an instantaneous overview of contaminants in the marine environment. This approach is especially useful in the absence of reliable data from a region. First interpretations of the data allow an appraisal of pollution hot spots. Surveys can include rapid assessment of marine pollution (RAMP) techniques (Galloway *et al.*, 2002) to extend coverage and case studies of emerging pollutants to give a preliminary assessment as to their potential importance in a region.

Ambient or state monitoring involves the regular measurement of a set of parameters. Both the frequency of measurements and the time scale of surveillance can vary from days to years, depending upon the purpose. Similarly, the media examined can include water, sediments and / or biota. The data can be used to estimate transboundary transport of contaminants. With time and sufficient data, trend analysis can be used to judge, for example, the efficacy of environmental protection regulations and policies.

Biological effects monitoring measures biochemical responses in organisms to ambient pollution. Many of the RAMP techniques (Galloway *et al.*, 2002) are based on biochemical or physiological responses. Proponents of biological effects monitoring note that relative to chemical analyses, the costs are generally lower, procedures less complex and the overall process less time consuming. The disadvantage stems from many of the assays being non-specific. One exception is the use of imposex (*i.e.* masculinization) in marine gastropods, an effect highly specific to tributyltin contamination from marine antifouling paints (Gibbs & Bryan, 1996).

Compliance monitoring involves measurements at the point of discharge. This procedure is essential for reliable estimates of emission inventories and assessment of land-based sources of pollution, but gives little information regarding the environment itself.

The role of complementary research should not be underestimated. Studies may be laboratory-based, ranging from developing or adopting new analytical techniques to the introduction of new technologies. Environmental case studies may focus on novel or emerging pollution issues. Pilot studies can be used as the first step in expanding a regional monitoring programme (RMP) through the introduction of new parameters to be measured in a limited spatial context. Finally, pollution history can be investigated at a site by analysing contaminant concentrations down a dated sediment core.

As noted above, monitoring and assessment within a particular Regional Seas Programme may be stipulated for a particular task. This requirement will thereby influence the monitoring strategy, including number and type of samples, sampling frequency, and parameters to be measured. However, as shown in Figure 1, the data may much wider applications when used in global data compilations and assessments. Of course, bringing data together, both within a region and from different RSPs, invokes a number of assumptions with respect to data exchange agreements and data quality assurance.

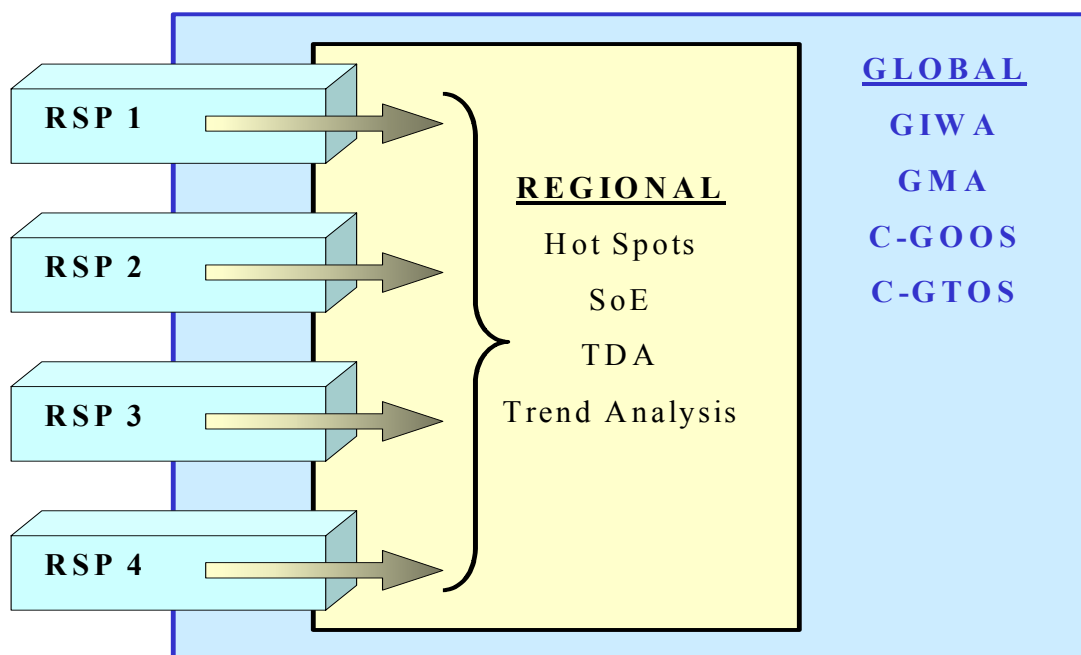


Figure 1 Potential uses of RSP databases at regional and global levels

2 Monitoring Requirements in UNEP Conventions and Action Plans

The texts of all Conventions, together with their additional Protocols, and the Action Plans are available on the Internet. In all cases, they include consideration of monitoring requirements. This section firstly provides relevant excerpts from the six RSPs that describe the requirements for the marine pollution monitoring. Thereafter, a précis of the commonalities is given, together with an interpretation of the implicit steps required in achieving a regional monitoring programme.

The six Conventions and Action Plans considered here are all in force. With respect to the Barcelona Convention, the revised version signed on 10 June 1995 is not yet in force. Several Protocols have been signed, but few are yet in force, despite a lapse of several years in some instances. For example, the Contracting Parties to the Barcelona Convention have signed seven protocols and only four are in force, albeit that some amended Protocols have yet to come into force. Similarly for the wider Caribbean, the Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region entered into force 11 October 1996 and the Protocol Concerning Specially Protected Areas and Wildlife entered into force 18 June 2000, but the Protocol Concerning Pollution from Land-Based Sources and Activities has not yet entered into force. Accordingly, the monitoring and subsequent reporting procedures as specified in such protocols not yet in force are not mandatory.

Contracting Parties should be urged to ratify Protocols that have not yet come into force and in the meantime should be encouraged to comply with the concomitant monitoring and reporting requirements.

2.1 Barcelona Convention

Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean

Barcelona, Spain, first signed 16 February 1976 and revised on 10 June 1995

Article 12 MONITORING

1. The Contracting Parties shall endeavour to establish, in close cooperation with the international bodies which they consider competent, complementary or joint programmes, including, as appropriate, programmes at the bilateral or multilateral levels, for pollution monitoring in the Mediterranean Sea Area and shall endeavour to establish a pollution monitoring system for that Area.
2. For this purpose, the Contracting Parties shall designate the competent authorities responsible for pollution monitoring within areas under their national jurisdiction and shall participate as far as practicable in international arrangements for pollution monitoring in areas beyond national jurisdiction.
3. The Contracting Parties undertake to cooperate in the formulation, adoption and implementation of such annexes to this Convention as may be required to prescribe common procedures and standards for pollution monitoring.

2.2 Cartagena Convention

Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region
Cartagena, Colombia, 24 March 1983

Article 13 SCIENTIFIC AND TECHNICAL CO-OPERATIONS

1. The Contracting Parties undertake to cooperate, directly and, when appropriate, through the competent international and regional organizations, in scientific research, monitoring, and the exchange of data and other scientific information relating to the purposes of this Convention.
2. To this end, the Contracting Parties undertake to develop and co-ordinate their research and monitoring programmes relating to the Convention area and to ensure, in co-operation with the competent international and regional organizations, the necessary links between their research centres and institutes with a view to producing compatible results. With the aim of further protecting the Convention area, the Contracting Parties shall endeavour to participate in international arrangements for pollution research and monitoring.
3. The Contracting Parties undertake to cooperate, directly and, when appropriate, through the competent international and regional organizations, in the provision to other Contracting Parties of technical and other assistance in fields relating to pollution and sound environmental management of the Convention area, taking into account the special needs of the smaller island developing countries and territories.

2.3 Abidjan Convention

Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region; and Protocol
Abidjan, Ivory Coast, 5 August 1984

Article 14 SCIENTIFIC AND TECHNOLOGICAL CO-OPERATION

1. The Contracting Parties shall co-operate, with the assistance of competent international and regional organizations, in the field of scientific research, monitoring and assessment of pollution in the Convention area, and shall exchange data and other scientific information for the purpose of this Convention and its related protocols.
2. In addition, the Contracting Parties shall develop and co-ordinate national research and monitoring programmes concerning all types of pollution in the Convention area and shall establish, in co-operation with competent international and regional organizations, a regional network of national research centres and institutions to ensure compatible results. The Contracting Parties shall endeavour to participate in international arrangements for pollution research and monitoring in areas beyond their national jurisdiction.

3. The Contracting Parties shall co-operate directly or through competent international or regional organizations, in the development of programmes for technical and other assistance in fields related to marine pollution and sound environmental management of the Convention area.

2.4 Nairobi Convention

Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region
Nairobi, Kenya, 21 June 1985

Article 14 SCIENTIFIC AND TECHNICAL COOPERATION

1. The Contracting Parties shall cooperate, directly or with the assistance of competent regional and international organizations, in scientific research, monitoring, and the exchange of data and other scientific information relating to the purposes of this Convention and its protocols.
2. To this end, the Contracting Parties shall develop and coordinate their research and monitoring programmes concerning pollution and natural resources in the Convention area and shall establish, in cooperation with competent regional and international organizations, a regional network of national research centres and institutes to ensure compatible results. With the aim of further protecting the Convention area, the Contracting Parties shall endeavour to participate in international arrangements for research and monitoring outside the Convention area.
3. The Contracting Parties shall cooperate, within their available capabilities, directly or through competent regional and international organizations, in the provision to other Contracting Parties of technical and other assistance in fields relating to pollution and sound environmental management of the Convention area.

2.5 EASAP

No convention: Action Plan for the Protection and Sustainable Development of the Marine Environment and Coastal Areas of the East Asian Region
1981

Long term-monitoring and environmental assessment

18. It is imperative that monitoring programmes already underway, covering both the status of ecosystems, and levels and trends in distribution of pollutants, be continued within the framework of the action plan. In addition, efforts should be made to identify gaps in information which would require the establishment of expanded or additional monitoring programmes. The vital importance of long-term monitoring to help ensure effective management is stressed in many parts of Chapter XVII of Agenda 21. Long-term monitoring is also an essential feature of efforts to anticipate and mitigate the adverse effects of global change.

19. In order to keep abreast of international efforts to cope with global change, the action plan should incorporate elements relating to the immediate effects of resource use as well as the longer effects of atmospheric change. With respect to use, these would include data on the existing and projected levels of use and socio-economic demand. With respect to atmospheric change, these would include the effects of possible sea level change, and of the increasing amounts of ultraviolet radiation that penetrate the atmosphere due to depletion of ozone concentrations and that would adversely affect both terrestrial and marine communities.

Quality assurance for pollution monitoring

24. This activity would be of primary importance in the region because of the need to ensure that data gathered on the types and levels of pollution in the marine environment is updated to meet appropriate standards for quality and intercomparability.

25. The component on quality assurance for pollution monitoring is to be strengthened through an intensive programme of training and technical support of local scientists and technicians, including (UNEP/IG.26/6, Annex IV, paragraph 17):

25.1 Standardization of analytical techniques for measuring pollutant concentration, and of techniques used to measure the effects of pollutants on human health, fishery resources and marine and coastal ecosystems;

25.2 Introduction of quality control of analytical procedures within and among the laboratories participating in the action plan, including the conduct of regional intercalibration exercises on a regular basis to ensure intercomparability;

25.3 Assistance to the laboratories in the field of instrumental analysis through the establishment of a joint regional equipment service;

25.4 Training of scientists and technicians through existing national, regional and international institutions ready to offer their facilities;

25.5 Updating and development of compatible methodology for the handling, validation and regional evaluation of data collected through the above research projects.

2.6 NOWPAP

No convention: Action Plan for the protection, management and development of the marine and coastal environment of the Northwest Pacific region
1994

OBJECTIVES

1. 3.1 Objective 1: To assess regional marine environmental conditions by coordinating and integrating monitoring and data-gathering systems on a regional

basis, making the best use of the expertise and facilities available with the region on a collective and consistent basis.

(d) Establish a collaborative, regional monitoring programme, targeted to specific indicative parameters, and undertaken according to agreed, consistent procedures, following inter calibration to ensure regional and international compatibility;

(e) Emphasize research, survey and monitoring of environmental characteristics which extend beyond national boundaries, and resources which are shared on a regional basis, without prejudice to the relevant existing and future national legislations and intergovernmental agreements; research and survey of socio-economic activities, human needs and quality of life.

2.7 Overview

There is a number of key features that are readily apparent in most, if not all, of the Conventions and Action Plans:

1. The onus of responsibility and commensurate financial commitment for monitoring rests with the countries (Contracting Parties), and not the secretariat.
2. The Contracting Parties are encouraged to co-operate with competent international bodies.
3. Competent national authorities should be designated for marine pollution monitoring activities.
4. National monitoring programmes are to be co-ordinated, thereby creating a regional pollution monitoring system.
5. Monitoring should include areas outside national jurisdiction.
6. Monitoring requires common procedures and standards, including intercalibration, with a view to ensuring regional and international compatibility of results.

The intent of the Conventions and Action Plans is to harness national monitoring efforts, preferably in co-operation with international bodies. This tactic recognises that several issues extend beyond national jurisdiction, and may at times relate to transboundary issues. The underlying philosophy of this holistic approach is that the whole is greater than the sum of the parts. Thus, bringing together national data sets to produce a regional database should bring added value to all contributors.

Not all of the requirements to achieve this mutually beneficial end point are necessarily explicitly stated. Table 2 provides an overview of the essential steps. The pathway for generating the database starts with countries designating competent authorities to conduct national monitoring of marine pollution. It is noted that the terminology of the conventions is purposefully vague with respect to the particulars of what must be done. There are no stipulations as to what parameters should be measured or at what temporal resolution. However, the national efforts must be coordinated, which implies agreement on at least what is measured. There may be a need to specify measurement methodologies and frequencies. The spatial aspects are alluded to in that efforts should extend, by international agreement, to areas outside national jurisdiction. Regardless of the parameters to be measured, the Conventions and Action Plans recognise the problems of generating a harmonised data set.

This entails the need for a data quality assurance programme, or at least intercalibration exercises as indicated by NOWPAP. The final phase is exchange data, which allows the secretariat to compile information of relevance to the Convention.

Table 2 Monitoring Activities in Conventions and Action Plans

National Monitoring	<ul style="list-style-type: none"> • Designated competent authorities • Assistance of competent international and regional bodies
Regional Monitoring	<ul style="list-style-type: none"> • Co-ordination of national efforts • Common procedures and standards <ul style="list-style-type: none"> ○ Samples ○ Parameters ○ Locations ○ Frequency • Sites to include those in international waters • Compatibility of results <ul style="list-style-type: none"> ○ Intercalibration (external quality assurance scheme) ○ Technical assistance (training and capacity building)
Regional Database	<ul style="list-style-type: none"> • Data exchange of monitoring results • Scientific information of relevance to Convention

3 Ongoing Regional Monitoring and Assessment within Regional Seas Programmes

In contrast to the case for information about the text of Conventions and Action Plans, details regarding the results and outcomes of associated regional monitoring programmes are much less easy to find on the Internet. Some Regional Seas Programmes maintain comprehensive and up-to-date web sites. The MAP web site includes a document search facility and the CAP web site allows a search of metadata. Some information about the Nairobi Convention and the EAAP is available, together with a searchable document archive. Other sites are in still under development (NOWPAP) or have not been updated for years (EASAP). While limited information regarding WACAF can be accessed through UNEP portals, this RSP seems not to maintain its own web site at this time.

Given that only limited information was available, this approach was not feasible for obtaining current information about monitoring and assessment of marine pollution. Accordingly, the Programme Coordinators were sent a questionnaire (see Annex II).

Another source of information was the Global Marine Assessments (UNEP, 2003). All RSPs outside Africa indicated that data was available for integration into a GMA, albeit with a number of caveats.

3.1 Barcelona Convention

The information here is based on the completed questionnaire returned from the MAP Secretariat. UNEP-MAP has had a longstanding monitoring programme, MED POL. Currently in Phase III, there are several types of monitoring under way: biological effects, compliance, state, and trend. However, coverage throughout the region is not uniform, particularly as less than half of the countries have bilateral agreements with MAP. In some countries, more than one laboratory is involved for a given type of monitoring. Overall, the monitoring activities involve:

- Biological effects: 6 countries/10 laboratories
- Compliance: 9 countries/35 institutes
- State (contaminant in biota, sediment and nutrients in sea water): 9 countries/31 laboratories
- Trend (contaminants in biota, sediment, pollutants loads): 9 countries/32 laboratories

Details of the state and trend monitoring in the different countries are shown in Table 3. This compilation reflects commitments made in bilateral agreements with UNEP-MAP, rather than what has actually been implemented.

A Data Quality Assurance Programme for chemical analyses has been in place since the outset of the monitoring programme and is run under contract by IAEA-MEL. Concerning biological effects monitoring, the University of Alessandria, Italy runs intercalibration exercises under contract. Negotiations are ongoing to contract an institute to act as a regional reference centre for eutrophication monitoring.

Over the years, MAP has provided considerable financial assistance towards augmenting human (training and education) and physical (capacity building) resources in the region. The support has included training, fellowships, workshops, scientific visits, and specialist

meetings. Capacity building has included the provision of analytical instrumentation, together with chemicals and general lab ware. However, the MED POL Programme's financial contribution represents only a small part of the funds invested by the countries to carry out monitoring.

Table 3 MED POL Trends and State Monitoring Programmes

Country	# of monitoring areas and stations	Sample type	Frequency	Parameters
Albania	3 areas 5 stations	BIO WAT	Annual Semi-annual	TM, HH BOP, NUT, Chl-a
Croatia	9 areas 36 stations	BIO, SED LOADS	Annual Monthly	TM, HH, PAH BOD, COD, TSS, NUT etc.
Cyprus	6 areas 55 stations	BIO WAT LOADS	Annual Semi-annual Semi-annual for point sources Weekly for atmospheric particulate matter and occasionally for TM	TM, HH BOP, NUT, TSS, BAC NUT, TSS, COD, BOD, BAC PM, TM
Greece	9 areas 127 stations	BIO, SED WAT LOADS	Annual Semi-annual Seasonal	TM, HH BOP, NUT, Chl-a BOD, COD, TSS, NUT etc.
Israel	2 areas 42 stations	BIO, SED WAT LOADS	Annual Annual Daily, monthly or semi-annual for point sources Weekly for atmospheric source	TM BOP, NUT BOD, COD, TSS, NUT etc. TM, NUT
Slovenia	1 area 28 stations	BIO, SED WAT LOADS	Annual Monthly, seasonal or annual Semi-annual or annual	TM (for biota), HH, PAH BOP, NUT, BOD, COD etc. BOD, COD, TSS, NUT etc.
Syria	2 areas 20 stations	BIO, SED WAT LOADS	Annual Semi-annual Seasonal	TM, HH, PAH BOP, NUT, BOD, COD etc. BOD, COD, TSS, NUT etc. TM, PM for atmos. loads
Tunisia	11 areas 20 stations	BIO, SED WAT LOADS	Annual Annual or semi-annual	TM, HH BOP, NUT BOD, COD, TSS, NUT etc.
Turkey	13 areas 24 stations	BIO, SED LOADS	Annual Seasonal	TM, HH, PAH BOD, COD, TSS, NUT etc.

3.2 Cartagena Convention

The information here is based on the completed questionnaire returned from the CAP/RCU. As noted previously, there are several provisions under the Cartagena Convention requiring monitoring activities. Presently the Regional Coordinating Unit has no information on what monitoring is being implemented. Much of this activity seems to be in abeyance, pending the entry into force of the Protocol Concerning Pollution from Land-Based Sources and Activities. Accordingly, there are also no clear reporting procedures yet in place for countries to submit monitoring data to the Secretariat. Similarly, there is no data quality assurance scheme or mechanism to re-evaluate monitoring priorities or emerging pollution issues. However, Technical Reports (e.g., IWCAM SIDS Project) of projects related to implementing the Protocol are accessible to the public via the Internet.

Such projects form the basis by which the Secretariat can sponsor and encourage research and pilot studies in the region. Similarly, they form the means by which the Secretariat can provide financial assistance towards augmenting human (training and education) and physical (capacity building) resources in the region. Moreover, the Secretariat has accessed external finances to support monitoring programmes from the Caribbean Trust Fund (CTF) and earmarked extraordinary contributions from various funding agencies, including UNF, USAID, SIDA, and Member States. Also, the RCU has two GEF-funded projects on Reducing Pesticide Run-off to the Caribbean Sea, and Integrating Management of Watersheds and Coastal Areas in SIDS.

3.3 Abidjan Convention

Only very limited information is available for the West African region. There have no sustained activities in the region, other than some capacity building and training carried out before 1994. Information on the Internet is very sparse, particularly as WACAF does not maintain a web site. There are no details given regarding ongoing marine pollution monitoring and assessment programmes. It is noted that a joint UNEP-UNDP GEF project has been approved for the Gulf of Guinea region.

3.4 Nairobi Convention

Information, outlined below, was received from the Programme Coordinating Unit. Information on the Internet is relatively sparse. Some information about the Nairobi Convention and the Eastern African Action Plan is available through the UNEP portal (<http://www.unep.org/eastafrica/>). This includes access to various online documents. There are no details provided with respect to ongoing marine pollution monitoring and assessment programmes. A twinning agreement has been reached between HELCOM and the Nairobi Convention, which will enhance the ongoing technology transfer and exchange of knowledge. Neither web site provides additional information.

Assessments of marine pollution in the coastal and marine environment of the Eastern African region has been conducted through a series of interrelated projects since the early 90s. Three phases were developed and implemented, despite the financial limitations and the weak scientific institutions within the region.

Phase One (1990-1995) focused on capacity building and training within the region, in collaboration with the IAEA, WHO and UNESCO-IOC. Specific activities included the establishment of a network of cooperating institutions, a regional survey of land-based sources of pollution, site-specific pollution assessment and monitoring at reference sites. Eight national reports and a regional report on the sources and amounts of pollutants from land-based sources were prepared, together with an overview on measures and practices applied for control of pollution.

During Phase Two (1996-2000), the activities comprised short-term assessments, preparation of national status reports and identification of hot spots. One objective was to use reports from Phase One activities to urge governments to develop policies and measures designed to mitigate or eliminate marine pollution problems in the region and to promote the adoption of strategies that contained solutions for identified site-specific problems. The Global Program of Action (GPA) for the Protection of the Marine Environment from Land-Based Activities funded a number of catalytic activities. The Nairobi Convention implemented a SIDA-sponsored project entitled "Protection and Management of the Marine and Coastal Areas in the Eastern African Region". Activities during Phase Two identified priorities areas for intervention and concluded that the coastal waters of the Eastern African region received heavy loadings of organic matter from domestic sewage and other sources. National reports were used to develop National Coastal Management strategies and coastal profiles, together with a regional strategy to mitigate or eliminate marine pollution from heavy loadings of organic matter from domestic sewage and other sources, and nutrient and water quality monitoring.

Phase Three (2001-2007) will see the implementation of projects designed to mitigate or eliminate pollution problems within the eastern African region. Relevant activities receive financial support from SIDA, GEF and Norway. Although various hot spots have been identified, the total extent and magnitude of pollution of coastal waters remains unknown. Thus, the GPA component focuses on an assessment of the extent and magnitude of pollution of coastal waters due to sewage, industrial effluents and river run-off, and to design demonstration activities that mitigate or eliminate land-based pollution. A GEF-Norway funded project entitled "*Addressing land-based activities in the Western Indian Ocean*" will fund actions that directly reduce coastal pollution and degradation, especially at hot spot sites.

3.5 EASAP

Some information was received from Programme Coordinating Unit. It is noted that the content on the Internet is very sparse, particularly as the EASAP web site is out of date. The UNEP GEF Project on Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand is underway in the region, but the linkages to the EASAP are not clear.

Formal country agreements for coastal and marine environmental issues are difficult to achieve in the absence of a convention in the East Asian Seas region. Although pollution monitoring has indeed been identified in the Action Plan as a regional need, there remains no regional monitoring in effect. This shortfall stems from the lack of agreement on monitoring methodology and the identification of monitoring sites, together with the limited resources in the region.

The US Department of State is funding a regional project on land-based sources of pollution to the marine environment. UNEP EAS/RCU is presently implementing this project, which includes monitoring as one of the activities. There are many national monitoring sites throughout the region in hot spot and control areas. EAS/RCU will examine the coordination of the methodology, data collection and storage, and the analysis of monitoring results with the aim to improve coordination of marine programmes in the region.

3.6 NOWPAP

The information here is based on the completed questionnaire returned from NOWPAP. As noted previously, the action plan includes regional monitoring and assessment of marine pollution. The key tasks comprise the establishment of a comprehensive database and information management system, together with launching a collaborative, regional monitoring programme.

At the regional level, three Regional Activity Centres (RACs) share the responsibilities for implementing the regional monitoring and assessment of marine pollution.

- DINRAC, Beijing, China - the Data and Information Network RAC implementing the establishment of a comprehensive database and information management system
- POMRAC, Vladivostok, Russian Federation - the Pollution Monitoring RAC, which supports the implementation of monitoring of both riverine and atmospheric inputs of pollution into the marine and coastal environment
- CEARAC, Toyama, Japan - The Special Monitoring and Coastal Environment Assessment RAC, which implements remote sensing and monitoring of Harmful Algal Blooms (HABs).

As from early 2003, the three RACs are just starting to establish their respective regional activities. They are trying to determine what existing databases can be shared, establishing the base for a comparative study of monitoring programmes and deciding on techniques. As outlined in the Action Plan, a future intent is to ensure comparability of regional data through externally organised intercalibration exercises.

One current difficulty stems from mixed / shared responsibilities between different entities (*e.g.*, ministries, provinces, prefectures, navy, scientific programmes and institutes) within the Member States. There is an obvious need to ensure clear communications, areas of responsibilities and coordination at the national level, before success can be guaranteed at the international level.

Funding comes from the NOWPAP Trust Fund for the regional activities of the RACs, with some support of UNEP. The governments finance the various national activities. Currently, NOWPAP has a partnership with IOC/UNESCO/GOOS on data and information transfer activities. Future collaborations under consideration include IOC for work on HABs and the IAEA for data quality assurance for monitoring programmes. Also, a UNEP-GEF project is under development aiming to prioritise problems based on regional assessments.

3.7 Overview

In general, the Contracting Parties to the various Conventions, Protocols and Action Plans have failed to discharge their responsibilities as agreed in the various instruments. There is no clear evidence of a viable regional monitoring and assessment programme operating in a UNEP RSP, with the exception of the MED POL programme. It should be stressed that the onus of responsibility, and the commensurate long-term financial commitment, for monitoring is at the national level. Countries have generally not established the monitoring and assessment capabilities that are required to fulfil their obligations stipulated in the Conventions.

The MED POL programme has much to offer the other regions in terms of lessons learned. It has undergone a long development since 1976. Throughout its history, there has been an externally run quality assurance programme. Currently, the programme is in Phase III and a Phase IV is soon to be developed. With regard to the present situation, there are only 9 countries that have bilateral agreements with UNEP-MAP for monitoring and assessment. On one hand, this could be interpreted as being quite discouraging as only a small percentage of the Contracting Parties are implicated. On the other hand, it can be seen as very reassuring in that these countries have demonstrated a commitment to environmental protection, despite the relevant LBS Protocol, as amended in 1996, not yet being in force.

Relatively few details concerning the funding and financial viability of the regional monitoring networks was provided by any RSP. Nevertheless, based on the limited information provided, the RSPs seem to have few financial resources to assist regional monitoring programmes. Financial support has been solicited from various external organisations. Some RSPs have, or are preparing applications for, GEF-funded projects. Such projects commonly have a monitoring and assessment component, but have much wider expectations. In some cases, the financial contribution channelled through RSPs represents only a small part of the funds invested by the countries to carry out monitoring.

4 The Feedback Loop from Monitoring to Conventions

The Conventions generally have a similar feedback mechanism for results of monitoring to be evaluated by the Contracting Parties, which could then lead to policy changes and new Protocols. The two essential components of the process are fact finding and meetings of the Contracting Parties.

The conventions have similar wording in terms of defining the necessary data and the monitoring framework. This is usually found in an article on scientific and technical / technological co-operation, stating that the Contracting Parties are required:

- To exchange data as well as other scientific information for the purpose of this Convention
- To co-operate in the establishment and implementation of regional and other international research programmes for the purposes of this Convention
- To co-operate in the provision of technical assistance in fields relating to marine pollution

Also stipulated in the Conventions is the important role of the meetings of Contracting Parties. The responsibilities taken on by the Contracting Parties include:

- To assess periodically the state of the environment in the Convention area (Cartagena); to review work done on the state and effects of marine pollution (Barcelona); to review the state of pollution in the Convention area (Abidjan)
- To consider the information submitted by the Contracting Parties on the measures adopted by them in the implementation of this Convention
- To adopt, review and amend annexes to this Convention and to its protocols
- To establish working groups as required

These texts demonstrate some important facets of the Conventions. Data exchange is explicitly required, and monitoring is meant to strive for uniformity of effort throughout the region. Recognition of the importance of research indicates that the overall system is meant to be dynamic, with a view to providing an early warning system for initially unrecognised threats to the marine environment. This notion is reinforced in that meetings of Contracting Parties may set up working groups to investigate any matter of concern to the Convention.

The reporting process ultimately leads to the Contracting Parties. One important responsibility is to review the state of the marine environment. This requirement is explicit in the Conventions, and does not depend on LBS Protocols being in force. Further action to be taken to protect the marine environment is thus contingent upon scientific information being reported to the Contracting Parties for their attention at meetings.

Little information from the Regional Seas Programmes was provided that allows a reasonable assessment of the reporting functions to be made. Clearly, many features of the system must have been in place. Several Conventions have an associated LBS Protocol and have undertaken an assessment of land-based sources of pollution to the marine environment.

In the context of this report, considerable information was forthcoming from the MED POL Programme. With respect to regional pollution assessment and data reporting, countries are expected to report data and results every year using a standardised format available on software. Experts regularly carry out in-depth analyses of specific data sets. Intermittent reports on the state of the environment have been prepared (EEA, 2002; UNEP/MAP, 1990;

UNEP/MAP, 1996). The next synopsis, to be prepared in conjunction with the European Environment Agency, is planned for publication in 2005-2006. General information on MED POL Phase III monitoring activities, together with a data inventory, is accessible through Internet. Validated data of organic and inorganic contaminants in biota from 1975-1993 is available on a CD, which currently is freely distributed and soon will be accessible via the Internet.

UNEP-MAP has a mechanism to review and update the monitoring programme. As noted above, MED POL is now in Phase III, with a plan to start Phase IV in the 2006-2007 biennium. Hence, planning for Phase IV will commence this year. In this vein, emerging pollution issues are identified through expert meetings and followed up by the Secretariat in the framework of the MED POL Programme. Global issues are also taken into account. UNEP-MAP also sponsors a limited number of research projects. These can be established as case studies to investigate a particular problem of scientific or specific geographic interest. The mechanism allows local studies of emerging pollution issues. An important example was early work conducted on the presence of organotin compounds derived from marine antifouling paints (Gabrielides *et al.*, 1990). At present, biological effects monitoring programmes are carried out as pilot projects. Sampling strategies are subject to optimisation after 3-4 years of implementation.

5 A Strategy for a Regional Monitoring Programme

5.1 Conceptual Framework

The scientific method comprises a framework to conduct experiments, pose questions of nature and write scientific papers. The flow chart shown in Figure 2 is familiar, with a question asked (objective) and a correct methodology selected that will give results to be interpreted. To be of importance in a scientific context, the results and interpretation should provide new information that builds on prior knowledge. Having results, the first consideration, but often not explicitly expressed, must be confirmation that the method used was correct and that the data are reliable. Upon establishing that the results are fit for purpose, they can indeed be used to address the question asked. The next step is answering the question, but with a final self-evaluation of whether or not the right question was initially raised.

A framework to conceptualise the steps involved in environmental protection is shown in parallel to the scientific method in Figure 2. In this case, policies are put in place to protect the environment. Monitoring is necessary to evaluate the efficacy of the policies. The data allow such an assessment to be made. The initial interpretation must ensure that the data are fit for purpose, being reliable and appropriate. The assessment then allows a judgement to be made as to whether the policy in place is effective. In this context, monitoring is a management tool rather than an outcome in its own right.

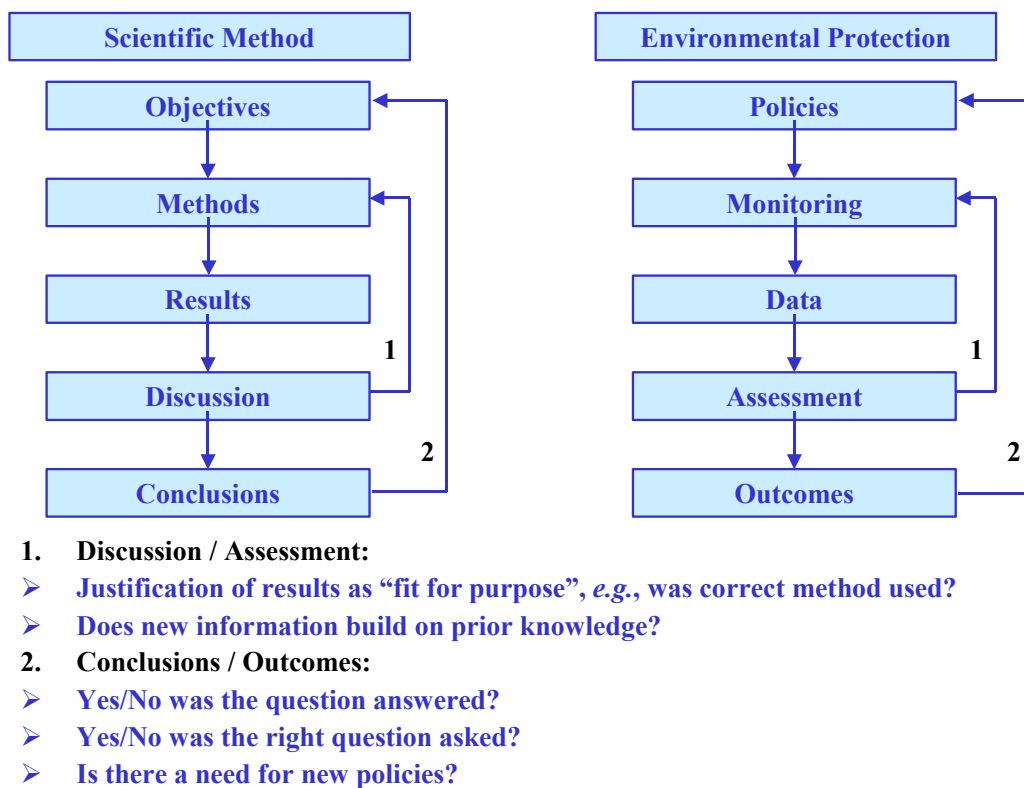


Figure 2 Comparison of the scientific method with a framework for environmental protection

5.2 Problems and Parameters

For environmental monitoring schemes, one size does not fit all. Even at the national level, priorities based on real and perceived problems may differ with location. This variability often leads to difficulties in establishing a uniform, nation-wide monitoring programme. A unique monitoring programme may not be the best use of resources, especially when funding is limited. Scaling to regional and global levels becomes increasingly problematical owing to the further complexity and variability of the issues, upon which may be superimposed distinct national prerogatives. In general terms, monitoring is likely to be addressed at the most serious problems facing the marine environment that are listed in Table 4 (GESAMP, 2001). As noted in Section 1.2, harmonising analytical protocols within and across regions will allow data interpretations across global scales.

Table 4 The most serious problems facing the marine environment (GESAMP, 2001)

Alteration and destruction of habitats
Changes in sediment flows due to hydrological changes
Climate change
Decline in fish stocks and other renewable resources
Effects of sewage and chemical pollution
Eutrophication

Although there may be some common sentiments as to what constitutes the most serious threats to the marine environment, agreement on a set of parameters to be included in a regional (or global) monitoring programme is often hard to reach. The problem is exacerbated with the knowledge that financial considerations tend to constrain a minimum number of parameters to be selected. For instance, there are 32 substances or groups of substances on the proposed list of priority substances for the EU 6th Water framework directive. Many require demanding and costly analytical procedures. Faced with such challenges and a multiplicity of possible parameters, the GOOS Coastal Module panel derived a model to aid selection (UNESCO, 2003). This model ranks variables based on lists of user groups, phenomena of interest, variables to detect and predict change and predictive models.

A list of generic parameters for a regional monitoring programme is given in Table 5. Individual RSPs would have to select the key or common parameters for their region. The RMP should harnesses the efforts of national monitoring programmes and the countries should already have selected parameters of particular concern to their interests. Accordingly, there may be some variables common to all or several countries, which would thereby facilitate initial selection. In the beginning, it is advisable to have just a few key parameters, because firstly capacity building is usually necessary to ensure that all countries are in a position to measure the parameters. Secondly, harmonisation of techniques and data quality also requires some time to ensure that all data within the region are compatible. With such a modular and flexible approach, new parameters can be added to the regional monitoring programme in response to changing priorities, new imperatives or emerging pollution issues.

A valuable vehicle for introducing new parameters is through sub-regional pilot studies and research projects.

Table 5 Parameters to be measured in a Regional Monitoring Programme

Medium	Rational	Key Parameters
Water	<ul style="list-style-type: none"> • State of the environment • Water use • Bathing water quality • Eutrophication 	<ul style="list-style-type: none"> • BOD/COD • Chlorophyll • Microbial quality • Nutrients • Petroleum hydrocarbons • Salinity, temperature, dissolved oxygen • Water turbidity / colour
Sediments	<ul style="list-style-type: none"> • State of the environment • Pollution trends • Pollution history (dated cores) 	<ul style="list-style-type: none"> • Agrochemicals (chlorinated pesticides)* • Industrial chemicals, including PCBs* • Metals • Organometallic compounds • Petroleum hydrocarbons, including PAHs
Biota	<ul style="list-style-type: none"> • State of the environment • Seafood safety (public health, export requirements) 	<ul style="list-style-type: none"> • Agrochemicals (chlorinated pesticides)* • Industrial chemicals, including PCBs* • Metals • Organometallic compounds (methylmercury, organotin) • PAH metabolites[#] • Petroleum hydrocarbons
Other Parameters		
Water	<ul style="list-style-type: none"> • Pilot projects 	<ul style="list-style-type: none"> • Chemical Munitions
Sediment	<ul style="list-style-type: none"> • Case studies 	<ul style="list-style-type: none"> • Endocrine Disrupting Substances
Biota	<ul style="list-style-type: none"> • Emerging pollutants 	<ul style="list-style-type: none"> • Marine Antifoulants • Personal Care Products (PCPs) • Pharmaceuticals • Radionuclides

* POPs – Persistent Organic Pollutants; PTS – Persistent Toxic Substances

[#] using Rapid Assessment of Marine Pollution (RAMP) Techniques

The evolution of a RMP is depicted in Figure 3, which compares the parameters measured by different countries (designated by letter codes) in a variety of regions of differing maturity. Although all countries in Region 1 measure several variables, some countries do not measure any of the key parameters. All countries in Region 2 measure at least some of the key parameters. The ideal situation arises in Region 3 where all countries monitor all key

parameters. Several non-common variables are also measured, which reflects national priorities. As noted above, in time the number of key parameters may be expanded. It is implicit in such considerations that monitoring is a long-term commitment.

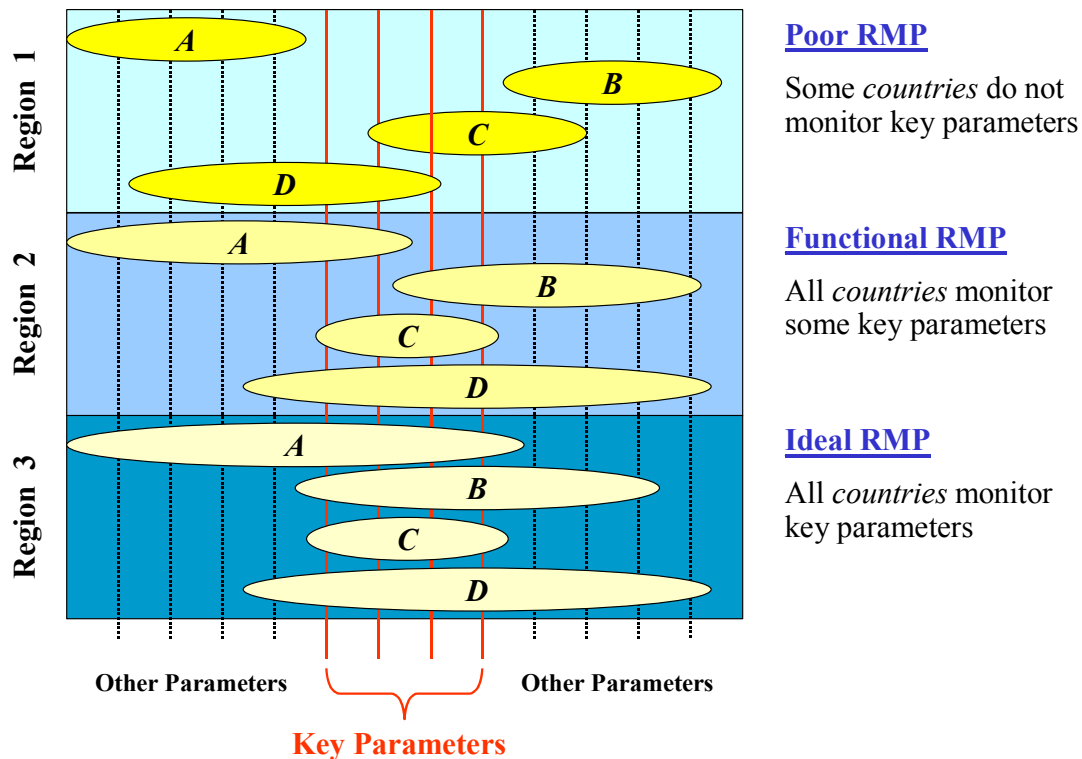


Figure 3 National (designated by A, B, C & D) and regional monitoring programmes

5.3 Data Quality Assurance

A fundamental requirement for the monitoring and assessment of marine contamination is accurate analytical data for pollutant concentrations in the various environmental compartments. For this purpose, the analytical methods used by the laboratories need to be validated and tested. Moreover, laboratories must adopt good Quality Assurance/Quality Control (QA/QC) practices and participate regularly in blind interlaboratory analytical comparison exercises (Ibe & Kullenberg, 1995). Interlaboratory comparisons are not only essential for checking the accuracy of the analytical results, but also serve to stimulate better analytical performance (Carvalho *et al.*, 1999). Of most importance in a regional text, an external QA programme permits an independent assessment of the quality of results from a network of laboratories. Such a system is an indispensable element in ensuring comparability between results, and can be incorporated into a regional database by providing data quality information for results provided by different laboratories. In the extreme case, data with poor quality assurance could be excluded from the database.

While accuracy cannot be compromised, the acceptable level of precision may vary depending on the use to be made of the data. Contaminant surveys can set higher tolerance

limits on the precision than would be acceptable in a trend-monitoring programme. In the first case, one aim might be to identify pollution hot spots in a region, based on those having the highest pollutant concentrations. In trend monitoring, data from one site (or possibly all sites within a country) might be used to determine whether or not a change in environmental quality can be distinguished. This interpretation would be based on being able to measure a statistical difference in pollutant concentration at a site or set of sites. The ability to establish that the concentration has indeed changed is highly dependent of the precision of the measurements. The precision will reflect both the analytical characteristics of the measurement and the environmental variability. Both aspects need to be considered and steps taken to minimise the variability, especially at the outset of a trend-monitoring programme.

The importance of precision in recognising change is illustrated in Figure 4. Data are shown for a set of 5 samples having an initial mean concentration of 100 and a relative standard deviation of 10%. If the mean concentration decreases by 5% per annum, for example due to improved environmental conditions or the diminished flux of a pollutant, then the change at this site will be recognisable at the 95% confidence level after 4 years. This example may be applicable for metal pollution at a site. Analyses can generally be obtained with a relative standard deviation of 10%. However, the situation would be much different for analyses of many organic contaminants. Not only is a relative standard deviation of 10% difficult to achieve, but also the analyses are time-consuming and expensive, and thus, often fewer (possibly only one) analyses per site are performed.

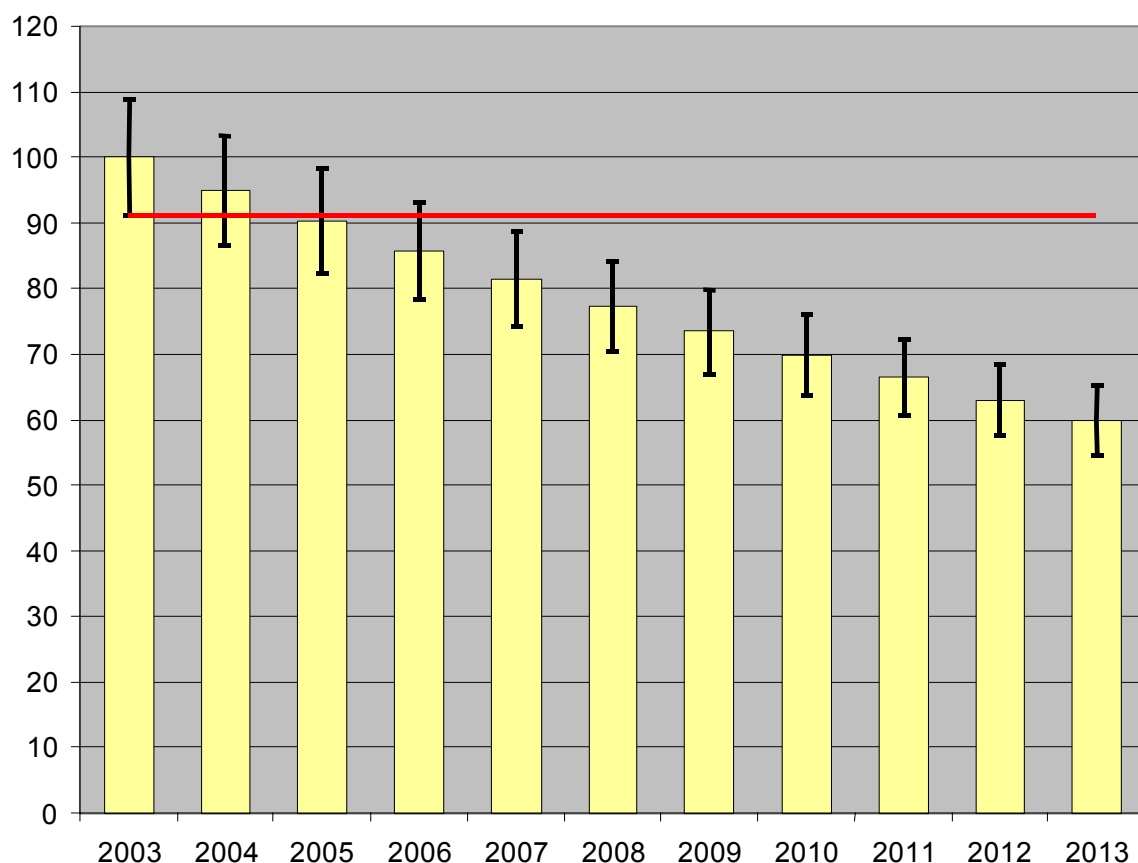


Figure 4 This model shows the trend for relative concentrations based on an initial concentration of 100%, with a standard deviation of 10% for 5 samples, assuming a change in the mean value of 5% per year. The bars and whiskers show the mean value \pm 95%

confidence interval. The horizontal line highlights the initial mean concentration minus the 95% confidential interval.

The number of years required to recognise a difference in concentration at the 95% confidence level is illustrated in Figure 5 for a wider range of samples and relative standard deviations, assuming a downward concentration trend of 5% per annum. For a determinand having a relative standard deviation of 25%, as is commonly observed in environmental surveys for some metals and many organic contaminants, a change will be recognised after 3 years if 50 samples are measured (*e.g.*, a country-wide survey), but will take 9 years if the sample size is only 5 (*e.g.*, as might be the case for examining the improvement at a hot spot). The number of years falls to 2 and 4, respectively, if the standard deviation is 10% rather than 25%. In contrast, the respective number of years rises to 6 and 19 for a standard deviation of 50%.

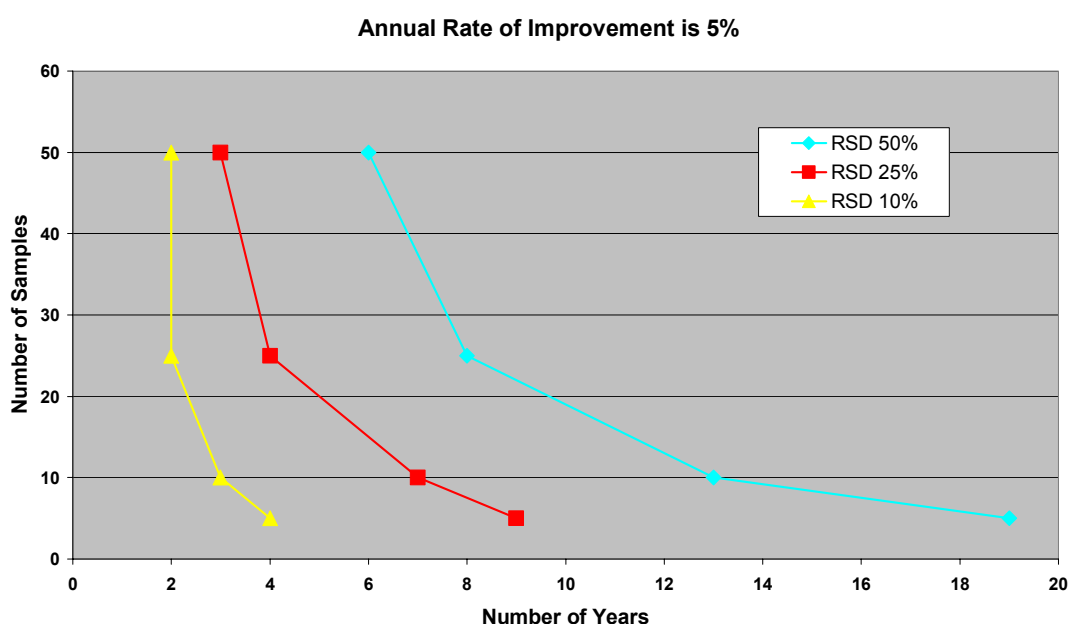


Figure 5 This figure shows the number of years required before a difference in pollutant concentration can be recognised at the 95% confidence level at a given site or set of sites, assuming a decrease in the mean concentration of 5% per annum, depending on the number of samples analysed and the relative standard deviation of the measurements.

5.4 Development and Implementation

There are several steps involved in developing and implementing a regional monitoring programme. The five principal stages are shown in Table 6, together with the key considerations at each stage. These steps are considered in turn.

5.4.1 Defining Problems and Parameters

As noted previously, the most contentious matter to be resolved in setting up a regional monitoring programme is to have agreement on what is to be measured throughout the area. Firstly, there may well be differing perceptions across the region as to what constitutes the

Table 6 Development and implementation of a regional monitoring programme

1. Defining Problems and Parameters
<ul style="list-style-type: none">• Perceived Problems – gathering input<ul style="list-style-type: none">• Governmental authorities• Scientific experts (national, regional, international)• Stakeholders• NGOs• Civil society• Donors• Contaminant Screening<ul style="list-style-type: none">• Reliable data collection• Include RAMP techniques• Marine pollution assessment• Regional meeting<ul style="list-style-type: none">• Agree on parameters and methods• Set priorities• Establish funding strategy
2. Network Building
<ul style="list-style-type: none">• Capacity building• Training• Initial measurements<ul style="list-style-type: none">• Joint cruises• Split sample analyses• External DQA• Data Exchange• Regional database creation
3. Implementation of RMP
<ul style="list-style-type: none">• Co-ordinated monitoring (regular & routine, long-term vision)<ul style="list-style-type: none">• Agreed Parameters• Harmonised Methodology• Ongoing external DQA• Consistent Reporting
4. Review and Evaluation
<ul style="list-style-type: none">• Evaluation of laboratory network (external DQA)• Appraisal of parameters (emerging issues)• Appraisal of Methodology (new techniques)• Regional assessment of marine pollution (SoE)• Trend analysis (efficacy of policies)• Recommendations for research and pilot studies
5. Reporting to Contracting Parties
<ul style="list-style-type: none">• Assess the state of the environment• Establish working groups as required• Review and amend annexes to the Convention and its protocols

greatest environmental concern. Secondly, there is often a tendency to want to establish an overly ambitious regional monitoring programme, with little understanding of the time scales and effort required to achieve harmonised data quality. The monitoring should, of course, be aimed at addressing the key environmental problems for the region as a whole and seek uniformity of effort in the various countries.

A successful regional monitoring programme depends on national commitment for the good of the region. A crucial first step is therefore to define the key issues and concerns on a regional basis. This can be started by way of a series of meetings with the participation of government authorities, scientific experts from both within and outside the region, stakeholders, civil society and NGOs. It would be beneficial to have potential donors at some such meetings, partly to ensure that the programme that is eventually developed can be fine-tuned to satisfy eligibility criteria. In some instances, these meetings may provide an overview of the perceived problems that may not necessarily be substantiated by scientific information. Indeed, environmental data may be unreliable, not acceptable throughout the region or non-existent.

Accordingly, the outcome of these meetings may be to help define a limited number of parameters for study in a regional contaminant survey. Such a survey could either substantiate or alleviate the apparent concerns. With respect to such a regional survey, one crucial aspect is to generate a reliable data set that is irrefutable in the region. Often, this aim cannot be achieved by one or even a series of laboratories in the region. In some cases, the appropriate expertise or laboratory facilities may be lacking. Sometimes the countries involved do not want to see all samples analysed in only one country within the region. Thus, an external centre of excellence can assist, with the benefit of applying uniform techniques across the region to ensure a harmonious and internally consistent data set. Alternatively, the external laboratory can incorporate split sample analyses within the survey, thereby helping to foster a Data Quality Assurance programme. This approach is preferably in that it recognises the need to develop capacity in the region. Such a contaminant survey could blend RAMP techniques (Galloway *et al.*, 2002) with chemical analyses of pollutants. Such techniques are relatively quick and easy to perform, and can readily extend the coverage of the survey. However, many of the assays are non-specific and so must be backed up by chemical measurements to ease interpretation.

Finally, a regional meeting of experts would be necessary to marry the concerns of the various preliminary meetings with the data from the regional contaminant survey. This meeting would need to define the key regional problems in the marine environment and agree on the parameters and methods to comprise the RMP. Moreover, it is important for this group to suggest a funding strategy for establishing the RMP.

The RMP should not seek to be too ambitious in the first instance, because an important facet is to achieve uniformity of effort and quality of environmental information. This requires networking, as discussed below, and may take many years to achieve. A modular RMP, starting with a few key parameters, can expand in time as the laboratory network becomes better established and in response to emerging pollution issues. The ideal RMP would thus focus on a limited number of parameters in selected environmental compartments. A universal list cannot be stipulated, but a few guidelines can be suggested. Measurements in the water column might include chlorophyll and nutrients. However, measurements of metals and organic contaminants should be limited to sediments and biota because such

determinations in the water column give very limited information. Water samples are very difficult to collect and analyse without contaminating them. Moreover, the analyses themselves are very costly. The RMP could start with only a few metals under investigation, together with total petroleum hydrocarbons and some organic contaminants, probably selected from among the POPs. National monitoring programmes should be encouraged to be more ambitious than the regional programme, but with commensurate assurances on the quality of data and the knowledge that they would be encouraged, but not required, to provide all data for a regional database.

5.4.2 Network Building

A successful regional monitoring and assessment programme depends on a uniform laboratory network providing (exchanging) a harmonised data set to create a regional database. This implies the need for a high degree of co-ordination and co-operation within the region. In the first instance, the laboratory network will have to be established to ensure good regional coverage. This system generally requires capacity building for less developed nations and training in sample collection and analysis. To this end, multi-national participation on scientific cruises should be encouraged.

To ensure harmonised data quality may involve training to help laboratories to set up their own quality control procedures. An externally operated data quality assurance programme is essential, whereby intercomparison exercises and proficiency tests are conducted for the region. Given that laboratories in the region may have varying degrees of competency, split sample analyses can be organised to provide early assurance to the better laboratories on the quality (*i.e.* regional acceptance) of their results. Finally, data must be provided to the Secretariat or RCU. This requires agreement on the reporting format and should allow for data quality flags to be attached to data sets.

5.4.3 Implementation of RMP

Differing national priorities and perceptions about marine environmental problems may mean that national monitoring efforts initially vary vastly in scale. However, agreement on a limited number of parameters and creating a region-wide laboratory network to ensure good results for these limited parameters allow the RMP to be implemented. Thus, regular, routine measurements of parameters will be conducted using harmonised methodologies. A consistent reporting format allows a database to be created.

5.4.4 Review and Evaluation

The role of the Secretariat or RCU, with external and regional experts as required, becomes very clear once the regional monitoring programme is in place and a regional database is produced. The RCU must review the performance of individual laboratories, the RMP as a whole and interpret the environmental data. These activities would be in preparation for reporting to the meeting of Contracting Parties.

The RCU must ensure that laboratories in the network are performing in a satisfactory manner. They are required to keep abreast of the evaluations from the external DQA

providers. Poorly performing laboratories may need additional assistance, either through training or the provision of equipment and instruments. Consistently poor analytical results may require quality assurance visits from experts. The implications of a poorly performing laboratory must be made known from the outset of the RMP. Poor data should either be excluded from the regional database, or at least be highlighted as being of limited applicability.

There is an ongoing need to review both the parameters in the RMP and the methodologies in use. Potential inadequacies or changes in operation might be explored in the first instance using small research projects and pilot studies.

Finally, the RCU must interpret the environmental data. The first step may be to use data to identify pollution hot spots and undertake a transboundary diagnostics analysis. Periodically there is the obligation to undertake a regional assessment of marine pollution (*i.e.* SoE). In time and depending on the quality of the data, the results can be used to perform a trend analysis, which should serve as a diagnostic tool to evaluate the efficacy of policies in the Convention area.

5.4.5 Reporting to Contracting Parties

The monitoring and assessment of pollution in the marine environment is ultimately reported to the meeting of the Contracting Parties. This body must decide whether the regional monitoring programme satisfies the needs in implementing the Convention and its protocols. Charged with the responsibility of periodically reviewing the state of the environment, the meeting of Contracting Parties can request changes to the regional monitoring programme or can decide that additional information is necessary, to be acquired via research and / or working groups. Finally, the meeting of the Contracting Parties must decide on the efficacy of the Convention and its protocols in protecting the marine environment, based on results of the regional monitoring programme and the assessment of the state of the environment. Inadequacies of such marine protection can lead the Contracting Parties to adopt, review and amend annexes to the Convention and to its protocols.

6 Financial Considerations

Establishing a regional monitoring programme for the marine environment is obviously a great undertaking needing long-term financial commitments. Consideration of the funding requirements and recommendations for financial strategies depends upon having a clear understanding of the roles and responsibilities of the different partners that contribute to the UNEP Regional Seas Programme. There are three key elements, operating at national, regional and global levels. Their duties, and hence commensurate financial requirements, are outlined below.

At the national level, Contracting Parties are obliged to set up a national monitoring programme as an explicit commitment to the Regional Convention or Action Plan. They must contribute relevant data to a regional database. Thus, the countries have an obligation to fund such monitoring. Also, they are obligated to contribute monetarily to a Regional Trust Fund that finances the Regional Coordinating Unit. Some of these monies can get redistributed back to the more needy countries to support operational activities. Countries can seek external support via bilateral agreements with donor countries, as exemplified by the Danish assistance towards water quality monitoring in Egypt. Generally, appropriate training and capacity building provides the country with the human resources and infrastructure to conduct monitoring. However, it should be well understood that such external support is invariably of limited duration and that operating costs for monitoring must eventually be borne by the country.

The Regional Coordinating Unit for each RSP has several very important tasks. The RCU must harmonise regional marine pollution monitoring, including all aspects of data quality management. They implement regional training and capacity building. The RCU must periodically evaluate the state of the marine environment. Locally, they should communicate and collaborate as appropriate with other regional and UN organisations having related marine interests in the region. Finally, they must liaise with the UNEP Regional Seas Coordinating Office in Nairobi, together with other Regional Seas Programmes. These activities should be financed through the Regional Trust Fund. Finally, one vital task of the RCU is to solicit external funding to support activities to monitor, assess and mitigate marine pollution. There are many mechanisms by which this can be achieved, and diverse successful examples include the MAP execution of a Mediterranean based GEF project and the recent twinning arrangement between HELCOM and the Nairobi Convention.

The Regional Seas Coordinating Office in Nairobi has a strong facilitative role to play. They should help cross-fertilise expertise and lessons learned from one region to another and seek to harmonise inter-regional monitoring strategies, which would then allow interpretation of data at the global scale. To date, such activities have been well served by the annual Global Meetings of Regional Seas Programmes and Action Plans. It is recommended that such annual reunions be continued. The Regional Seas Coordinating Office must liaise with other UNOs to ensure symbiotic marine environmental efforts. They must ensure that individual RSPs are aware of key ongoing programmes run via IOC regional GOOS, FAO fisheries and C-GTOS, and GEF International Waters projects. Finally, they should play a consultative role in assisting RCUs to mobilise external funding.

There are many recommendations, noted above, for soliciting external financing. Potential sources to explore are private foundations and donor countries / organisation, such as CIDA, SIDA, DFID, and USAID. However, one very important source of potential financial

assistance is GEF, which can support marine pollution monitoring and assessment as part of a larger effort aimed at pollution mitigation and remediation. There are many GEF International Waters Projects that are essentially regional and marine in character. The RSP – RCUs should provide a key avenue to execute such projects. This mechanism has been used successfully in the Mediterranean and Caribbean regions. Given that UNEP is one of the three implementing agencies for GEF and that there is a Division of Global Environment Facility Coordination (DGEF) in Nairobi, there should be more opportunities to develop GEF IW projects that can be executed through RSPs. The Regional Seas Coordinating Office must act as the conduit for fostering close links between individual RSPs and DGEF.

7 Conclusions and Recommendations

7.1 Ongoing Monitoring and Assessment in Relation to Regional Seas Conventions

In general, the Contracting Parties to the various Conventions, Protocols and Action Plans have failed to discharge their responsibilities as agreed in the various instruments. There is no clear evidence of a viable regional monitoring and assessment programme operating in a UNEP RSP outside the Mediterranean region. The onus of responsibility for monitoring is at the national level, and depends on political and financial commitments.

Recommendations

- Contracting Parties should establish the long-term national monitoring programmes that are required to fulfil their obligations as stipulated in the Conventions.
- Contracting Parties should be urged to coordinate national monitoring programmes, in association with competent international organisations as appropriate, in order to comply with obligations explicit in the Conventions and Action Plans.
- Contracting Parties should be urged to ratify Protocols that have not yet come into force and in the meantime should be encouraged to comply with the concomitant monitoring and reporting requirements.

7.2 Monitoring and Assessment Leading to Action in Regional Seas Conventions

Conventions do have a feedback mechanism in place for evaluating the effectiveness of policies and protocols based on national and regional monitoring. This includes the requirement for meetings of Contracting Parties to review periodically the state of the marine environment in the Convention area. The lack of a regional monitoring programme prevents such a review and effectively blocks the feedback mechanism for policy development.

Recommendation

- Contracting Parties should be urged to undertake a review of the state of the environment in their Convention area.

7.3 Strategy for a Regional Monitoring Programme

Several guidelines can be provided describing the general features to be incorporated into a regional monitoring programme. The key parameters in a given RMP should be chosen, based on scientific consensus rather than perceptions, to address the most important regional problems in the marine environment. The RMP should be flexible and modular, starting with a limited number of parameters, to which can be added in time depending on changing regional priorities and emerging pollution issues. The RMP can include both RAMP techniques and measurements of pollutants in the environment. A harmonised data set

requires agreement on methodologies and an externally operated data quality assurance programme. A consistent reporting format will allow results to create a regional database.

Recommendation

The following five steps should be considered in establishing a regional monitoring programme of benefit to the Contracting Parties:

- i. defining regional marine problems and parameters
- ii. network building for monitoring and data exchange
- iii. quality – assured pollutant measurements through the implementation of the RMP
- iv. review and evaluation of the RMP and assessment of marine pollution
- v. reporting to the meeting of Contracting Parties

7.4 Financial Support for Regional Monitoring Programmes

National monitoring is the fiscal responsibility of individual countries. Several donor countries and organisations have shown a willingness to support the establishment of pollution monitoring. Such external support is of limited duration and operating costs for monitoring eventually devolve to the country. The Contracting Parties to the Convention or Action Plan must monetarily support the Regional Coordinating Unit for each RSP, ideally with a supplementary contribution from the UNEP Regional Sea Coordinating Office for disadvantaged regions. However, the RCU must solicit external funding. The UNEP Regional Sea Coordinating Office should play a supportive role in seeking extrabudgetary funding. In particular, the UNEP Regional Sea Coordinating Office should facilitate communications between UNEP DGEF and the RSPs, both individually and collectively in order to promote the notion that RSPs can serve as an important mechanism to execute GEF projects in coastal marine environments.

Recommendations

- To support the monitoring and assessment of marine pollution, adequate funding must be allocated at three levels, namely nationally, regionally and globally.
- UNEP should continue to host an annual Global Meeting of the Regional Seas Programmes and Action Plans in recognition of its value in facilitating communications among RSPs, and between RSPs and Secretariats for other Conventions and UNEP divisions.
- UNEP Regional Sea Coordinating Office should facilitate communications between UNEP DGEF and the RSPs, both individually and collectively in order to promote RSPs as a means execute GEF projects in coastal marine environments.

8 References

Carvalho, F.P., Villeneuve, J.-P. & Coquery, M. (1999). Analytical intercomparison exercises and harmonization within environmental laboratories from developing countries. *International Journal of Environmental Analytical Chemistry* 74, 263-274.

EEA (2002). *State and pressure of the marine and coastal Mediterranean environment*, 5, European Environment Agency, pp. 137.

Gabrielides, G.P., Alzieu, C., Readman, J.W., Bacci, E., Aboul Dahab, O. & Salihoglu, I. (1990). MED POL survey of organotins in the Mediterranean. *Marine Pollution Bulletin* 21, 233-237.

Galloway, T.S., Sanger, R.C., Smith, K.L., Fillmann, G., Readman, J.W., Ford, T.E. & Depledge, M.H. (2002). Rapid assessment of marine pollution using multiple biomarkers and chemical immunoassays. *Environmental Science and Technology* 36, 2219-2226.

GESAMP (2001). *A Sea of Troubles*, 70, IMO / FAO / UNESCO-IOC / WMO / WHO / IAEA / UN / UNEP, pp. 35.

Gibbs, P.E. & Bryan, G.W. (1996). TBT-induced imposex in neogastropod snails: masculinization to mass extinction In de Mora, S.J., *Tributyltin: Case Study of an Environmental Contaminant*, (pp. 212-236). Cambridge University Press, Cambridge.

Ibe, A.C. & Kullenberg, G. (1995). Quality Assurance/Quality Control (QA/QC) regime in marine pollution monitoring programmes: the GIPME perspective. *Marine Pollution Bulletin* 31, 209-213.

UNEP (2003). *Global Marine Assessments: a survey of global and regional marine assessments and related activities*, UNEP-WCMC/UNEP/IOC-UNESCO, pp. 132.

UNEP/MAP (1990). *State of the Environment in the Mediterranean Region*, 28, MAP, pp. 168.

UNEP/MAP (1996). *State of the Marine and Coastal Environment in the Mediterranean Region*, 100, MAP, pp. 142.

UNESCO (2003). *The Integrated Strategic Design Plan for the Coastal Ocean Observations Module of the Global Ocean Observing System*, 125, pp. 190.

ANNEX I

Terms of the Review of Marine Pollution Monitoring and Assessment in UNEP's Regional Seas Programmes

Introduction

- A quick desktop review of ongoing monitoring and assessment activities in relation to the provisions of all the Regional Seas Conventions;
- Assessment on how monitoring and assessment lead to action as defined in the Conventions and their Protocols; and
- Suggestions for a realistic and focussed strategy for monitoring and assessment in support of policies and actions of Regional Seas.

Terms of Reference

- Outline commitments to marine pollution monitoring and assessment specified in the Conventions and Protocols including provision of a list of Articles as they relate to monitoring and assessment;
- Review monitoring and assessment undertaken at regional levels within the Regional Seas Programmes;
- Where regional monitoring and assessment is undertaken:
 - i) appraise steps taken to guarantee that a harmonised data set is achieved;
 - ii) evaluate database management procedures;
 - iii) review how data are used and reported; and
 - iv) briefly discuss how marine pollution monitoring is funded.
- Identify gaps in the present systems including emerging pollution issues and potential new technologies;
- Make recommendations for:
 - i) cross-fertilisation between the Regional Seas Programmes; and
 - ii) applying new technologies to implement Conventions and their Protocols.

Modality of review

- Accessing of information from UNEP about Conventions and their Protocols;
- Review of emerging pollution issues and modern technologies for rapid assessment of marine pollution;
- Making Recommendations; and
- Submitting a Draft Report for review at the 5th Global Meeting of the UNEP Regional Seas Conventions and Action Plans in Nairobi, Kenya, 25-27 November 2003.

Some further suggestions

- Catalogue/Inventory of monitoring and assessment provisions of Conventions and their Protocols
 - i) Monitoring and assessment provisions of all Conventions and their Protocols;

- ii) Providing information regarding which Conventions and their Protocols are in effect (*i.e.* the number of countries required for the Conventions and their Protocols to come into effect; the number of countries that have ratified the Conventions and their Protocols, etc);
- iii) Providing financial information from the Regional Seas Programmes with respect to total budget and funding designated for monitoring activities; and
- iv) Providing background information on how the UNEP- Global Environment Facility (GEF) Co-ordination Office helps or has helped the Regional Seas Programme with project development.

Monitoring and assessment:

- How many countries have active monitoring and assessment programmes? ;
- What types of monitoring and assessment are conducted (ambient, compliance, trend, biological effects, biodiversity)? ;
- How many laboratories are involved? ; and
- Regarding sampling: how many sites, sample type, frequency, and analytes (at the regional level).

Regional Pollution Assessment and Data Reporting

- What is the established procedure for reporting to the Contracting Parties? ;
- How often does the Regional Coordinating Unit (RCU) report on the state of the marine environment? ; and
- Are data accessible to the public via reports or the Internet?

Review and Update

- Does the RCU have a procedure in place to review data quality from countries and/or laboratories?;
- Is there a mechanism to re-evaluate monitoring priorities (*e.g.* how does the Regional Seas Programmes cope with emerging pollution issues)? ; and
- Are there research and pilot projects?

Financial Support

- Does the RCU provide assistance towards augmenting human (training and education) and physical (capacity building) resources? ; and
- What external finances have been accessed to support monitoring programmes (bilateral agreements with countries, GEF)?

Emerging Pollution Issues and Modern Technologies

- Review modern technologies for rapid assessment of marine pollution.

Collective Overview of Regional Seas Programmes and Recommendations

- Identification of major successes which could be transplanted from one Regional Seas Programme to another;
- Identification of key failures or inadequacies;
- Recommendations of new approaches to monitoring;
- Recommendations for new funding strategies; and
- Recommendations for new technologies.

Annex II

Questionnaire to UNEP's Regional Seas Programmes

Review Marine Pollution Monitoring and Assessment in UNEP's Regional Seas Programmes

Request for Assistance

The purpose of this message is to request information from the UNEP Regional Seas Programmes and Action Plans with respect to their ongoing marine pollution and assessment programmes. Earlier this year (May 30, 2003), you should have received a letter from Ms. Veerle Vandeweerd (UNEP) and Mr. R. Fauzi C. Mantoura (IAEA) forewarning of a review of current monitoring and assessment activities within UNEP Regional Seas Programmes and Action Plans to be undertaken. Focal points for the review process are Mr. Elik Adler (UNEP) and Mr. Stephen de Mora (IAEA).

The appended document outlines the information that is required at this time to initiate the review process. Your assistance with compiling and returning the data to us by October 1, 2003, would be much appreciated. Please contact us promptly if you contemplate difficulties with meeting this target deadline.

Do not hesitate to contact us if you require additional information of clarification. We look forward to receiving the information from you for this review.

Mr. Elik Adler
Regional Seas Coordinator
United Nations Environment Programme
PO Box 30552
Nairobi
Kenya

Email: ellik.adler@unep.org

Mr. Stephen de Mora
Laboratory Head- MESL
IAEA - Marine Environmental Laboratory
4 Quai Antoine 1^{er}
MC 98000 Monaco CEDEX
Principality of Monaco

Email: S.de_mora@iaea.org

Background

The information provided by UNEPs' Regional Seas Programmes and Action Plans (RSP/APs) will form the basis of a review of ongoing monitoring and assessment activities in relation to the provisions/articles of all the UNEP Regional Seas Conventions. This review has as objectives:

- to assess how monitoring and assessment activities lead to action as defined in the Conventions, or their Protocols
- to suggest a realistic and focussed strategy to strengthen monitoring and assessment activities, thereby ensuring regional seas are fully involved in the development process of establishment of the Global Assessment of the State of the Marine Environment and Global International Waters Assessment.

The following information is requested from RSP/APs. The annexed table may help to focus responses.

1. Catalogue of monitoring and assessment provisions in Conventions and their protocols

- Does your RSP/AP operate under the umbrella of a regional Convention?
- Provide information regarding which Conventions and Protocols are in effect (i.e. the number of countries required for the Conventions and Protocols to come into effect; the number of countries that have ratified Conventions and Protocols)
- List the requirements for monitoring and assessment in your regional Convention and Protocols.

2. Monitoring and assessment:

- How many countries in your RSP/AP have active monitoring and assessment programmes?
- What types of monitoring and assessment are conducted (ambient, compliance, trend, biological effects, biodiversity, etc.)?
- How many countries / laboratories are involved for each type of monitoring activity?
- Regarding sampling: how many sites, sample type, frequency, and analytes? (at the regional and national levels)?

3. Regional Pollution Assessment and Data Reporting

- What is the established procedure for reporting to the Contracting Parties?
- How often does the Co-ordinating Unit report on the state of the marine environment?
- Are data accessible to the public via reports or the Internet?

4. Review and Update

- Does the Co-ordinating Unit have a procedure in place to review data quality from countries and/or laboratories?
- Is there a mechanism to re-evaluate monitoring priorities (e.g. how does the RSP/AP cope with emerging pollution issues)?
- Are there research and pilot projects?

5. Financial Support

- Provide financial information from RSP/APs with respect to the total budget and the funding designated for monitoring activities.
- Does the Co-ordinating Unit provide financial assistance towards augmenting human (training and education) and physical (capacity building) resources in the region?
- What external finances have been accessed to support monitoring programmes (bilateral agreements with countries, GEF, etc.)?
- Provide background information on how the UNEP-GEF Co-ordination Office helps / has helped RSP/APs with project development.

