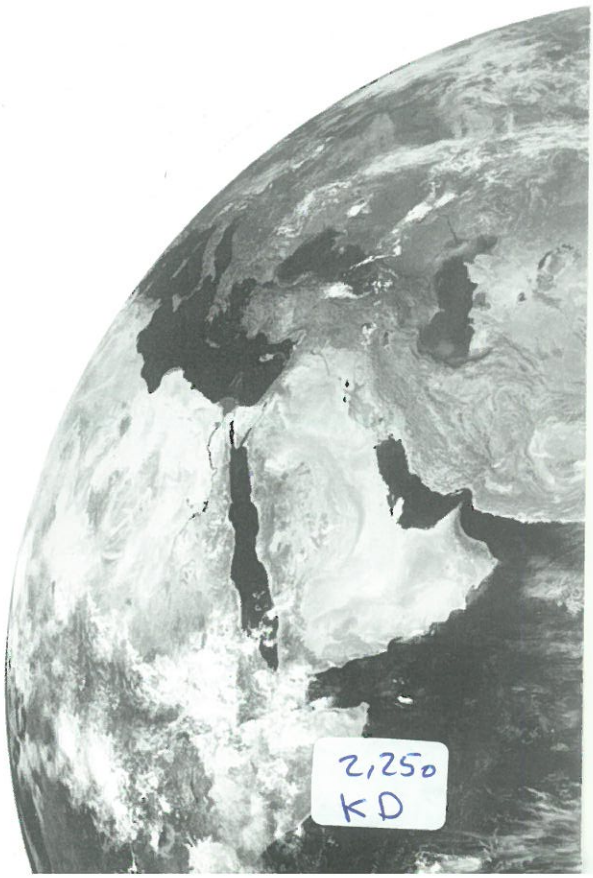
Guidelines for the Preparation of National Report on the State of the Marine Environment

ROPME/GC-6/005 (Rev.4)

Guidelines for the Preparation of National Report on the State of the Marine Environment*



Regional Organization for the Protection of the Marine Environment (ROPME)

UNEP

United Nations Environment Programme

* Enhanced under an MoU between ROPME and UNEP/ROWA

Regional Organization for the Protection of the Marine Environment (ROPME)

P.O. Box 26388
Safat 13124
State of Kuwait

Tel: +965 5312140 – 4
Fax: +965 5324172 / 5335243
E-mail: ropme@qualitynet.net
Website: http://www.ropme.org

Published in 2007
Previous editions in 1993, 1997 and 2002

These Guidelines were developed by the Seventh Task Team Meeting on Marine Monitoring and Research Programmes and the Technical Meeting to Develop Guidelines on the State of the Marine Environment Report (ROPME/WG-39/2) and were revised by the Ninth Task Team Meeting on Marine Monitoring and Research Programmes (ROPME/WG-67/2). The Second revision was made by the Meeting for the Preparation of the Regional Report on the State of the Marine Environment of the ROPME Sea Area (ROPME/WG-82/3) which also benefited from the GIPME Review that included evaluation of the parameters and indicators relevant to the State of the Marine Environment in the Region (ROPME-GIPME/2). The Third revision was made by the Meeting of the Contact Persons for the Preparation of the State of the Marine Environment – SOMER 2003 (ROPME/WG-114/4). This fourth revision has been made in collaboration with UNEP/ROWA under an MoU (MoU-ROWA-046/2005) with a view to enhance the contents in harmonization with the UNEP-GEO methodology in pursuance of ROPME-EXCOM Decision 3.1.1c and has been reviewed by the Regional Consultative Meeting 2007 (ROPME/WG-136/2).

In the Name of GOD
the Compassionate, the Merciful

sources together with recommendations of experts, and as such is maintained truly of consensus standards.

SOMER also aspires to present an in-depth analysis of the results from above sources and bring to the fore the important trends, issues and future scenarios that concern ROPME Sea Area (RSA). It is envisaged that SOMER caters to a large target audience, beginning from Decision Makers down to mundane researchers. So, SOMER is structured to evolve as a basic reference material for a large class of individuals and institutions that have stake in the marine environment and whose collective actions, based on the knowledge drawn from SOMER, should enable sustainable development of this Regional Sea.

Outputs

SOMER will be brought out in both digital form as well as a printed document. Following are the principal products of SOMER process:

- Hardcopy publication of detailed "State of the Marine Environment Report"
- Hardcopy publication of "Summary" of the SOMER
- Digital copy publication of Summary and detailed SOMER on CD media
- Web dissemination via ROPME website

Further, it will be attempted to bring out several spin off products from the exercise in the form of bulletins, case studies, success stories, guidelines, brochures and such other material to enhance the awareness in the Region as well as penetrate all rungs of the society that are required to be addressed.

Objectives and Scope of SOMER

The assessment of the Regional State of the Marine Environment, as highlighted in the Convention and in several Council Meetings, can be a reliable, scientifically credible and informative tool for integrated environmental management in the Region. The specific objectives are as follows:

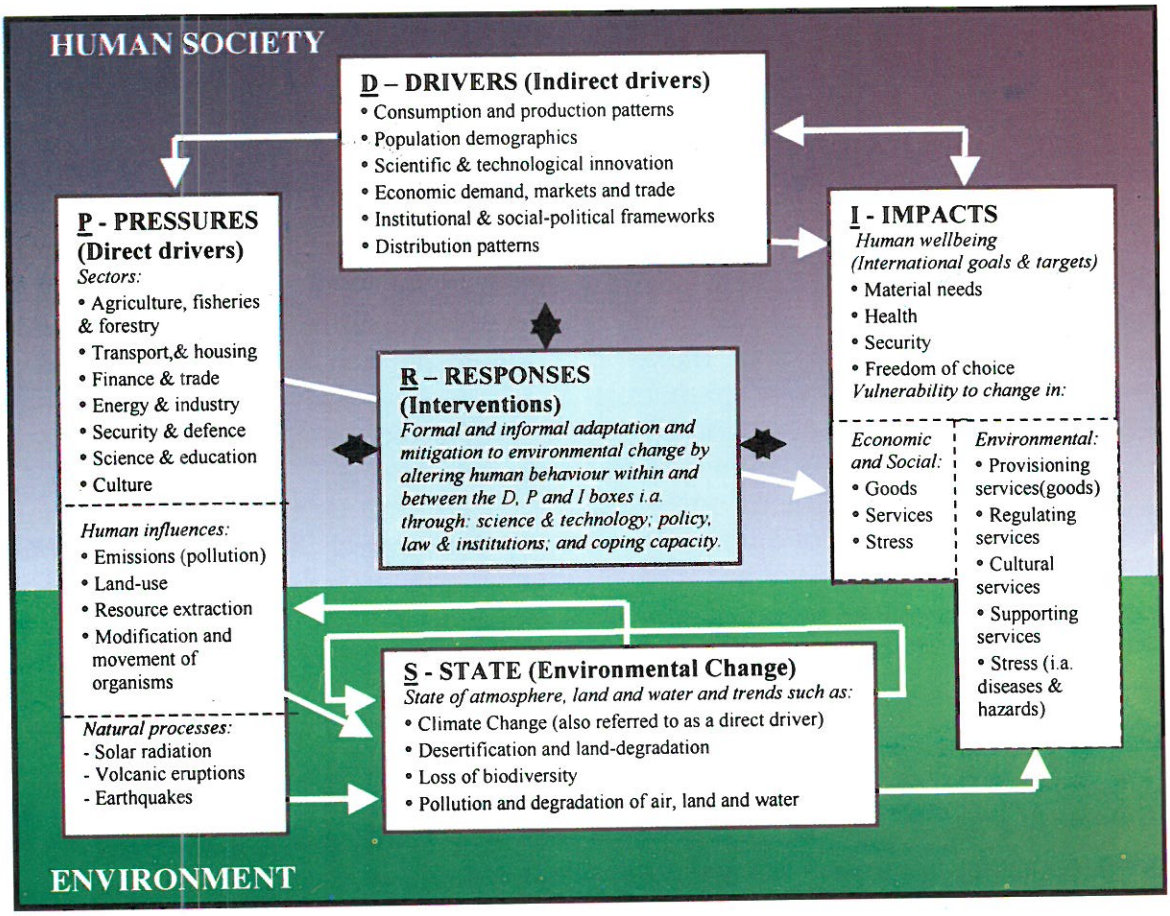
- To assess and document the current state of the marine environment of the RSA, giving due attention to recent changes in the environmental conditions and the impacts of human activities on the marine environment and coastal areas
- To identify current regional concerns and emerging issues which present major challenges
- To suggest Regional strategies, policy alternatives and priority actions commensurate with these concerns and issues to enable Governments and decision makers to meet these challenges at the national level, as well as in Regional and global contexts

II. Guidance for Preparing the National Report on the State of the Marine Environment

The national reports of Member States are to be prepared using the methods of integrated environmental assessment. While doing so, broad references can be drawn from the formats for data collection provided in this document. A meticulous planning exercise needs to be done by the focal points responsible for the preparation of these reports and a campaign to compile the data and information needs to be launched. The Member States may constitute working groups to analyse the information and make comprehensive assessments, which can collectively contribute to the preparation of SOMER. One continued aspiration in the Region has been to harmonize the process of preparation of National reports on the state of the marine environment and SOMER with the GEO of UNEP, which has been agreed to be broad based and enough focused towards supporting sustainable development of the environment. Recognizing this aspect, the concept of DPSIR (Driver, Pressure, State, Impact and Response), as one key component of the integrated environmental assessment, is considered an important alignment to the process of preparation of SOMER and the National Reports. Therefore, these Guidelines provide a brief canvas of the concept of DPSIR and urge the ROPME Member States to derive from the same during the preparation of national reports. Further, it is also essential while preparing the national reports to look at all the elements, including inter-linkage amongst DPSIR elements, opportunities and challenges, emerging issues, future scenarios and policy options, considering the past, present and future across various disciplines.

An analytical approach to human-environment interaction

The integrated environmental assessment of RSA needs to consider the conceptual framework of human-environment interaction, involving a detailed analysis of DPSIR concepts as schematically described below:



The UNEP Human - Environment Interaction analytical approach: - built on the Driver, Pressure, State, Impact and response (DPSIR) framework, the Millennium Ecosystem Assessment (MA) Conceptual Framework and vulnerability considerations. It is multi-scalable and indicates generic cause and effect relations within and among:

- DRIVERS: The drivers are sometimes referred to as indirect or underlying drivers or driving forces and refer to fundamental processes in society, which drives activities having a direct impact on the environment.
- PRESSURES: The pressure is sometimes referred to as direct drivers as in the MA framework. It includes in this case the social and economic sectors of society (also sometimes considered as Drivers). Human interventions may be directed towards causing a desired environmental change and may be subject to feedbacks in terms of environmental change, or could be an intentional or un-intentional by-products of other human activities (i.e. pollution).
- STATE: Environmental state also include trends, often referred to as environmental change, which could be both naturally and human induced. One form of change, such as climate change, (referred to as a direct driver in the MA framework) may lead to other forms of change such as biodiversity loss (a secondary effect of climate gas emissions).
- IMPACTS: Environmental change may positively or negatively influence human well-being (as reflected in international goals and targets) through changes in ecological services and environmental stress. Vulnerability to change varies between groups of people depending on their geographic, economic and social location, exposure to change and capacity to mitigate or adapt to change Human well-being, vulnerability and coping capacity is dependent on access to social and economic goods and services and exposure to social and economic stress.
- RESPONSES: Responses (interventions in the MA Framework) consist of elements among the drivers, pressures and impacts which may be used for managing society in order to alter the human – environment interactions. Drivers, pressures and impacts that can be altered by a decision maker at a given scale is referred to as *endogenous* factors, while those that can't are referred to as *exogenous* factors. Responses are at different levels, for example, environmental laws and institutions at national level, and multilateral environmental agreements and institutions at regional and international levels. Responses address issues of vulnerability of both people and the environment, and provide opportunities for enhancing human well-being.

DPSIR in the context of coastal and marine environment

The DPSIR in the context of coastal and marine environment, and biodiversity is not much different from the generic concept explained above. However, the expression of the components of DPSIR in the coastal marine environment could be highly pronounced at times, owing to the dynamic nature of the marine environment. A collection of data and information on lines of DPSIR is suggested in format 4.2. While this format should act in many ways as the primary source for integrated assessment, it is required to study the coastal and marine environment and biodiversity in a focused manner to make the synthesis specific to the marine environment. Further, a descriptive basis to identify and quantify the indicators, to enable such an exercise, is given below including the relevant examples. While care is to be taken to compile the information in the formats provided earlier, the following matrix of parameters as shown in the Table below can be used to synthesize information and knowledge.

Table showing examples of coastal and marine environmental, and biodiversity indicator matrixes*

Theme	Issue	Indicators	Question the Indicator Addresses	Type of Indicator (DPSIR)	Data Variables (parameters)	Units used
COASTAL/ MARINE	Coastal degradation	1- Population density in Coast line	How human induced activities affect the coast?	D	Total population Coastal length	no./km
		2- Annual amount of Crude oil loaded/unloaded	How oil activities affect the marine ecosystem/ tourism, etc.?	D/I	quantity of oil	metric ton/year
		3- Area of the Exclusive Economic Zone (EEZ)	Area available for exploitation of marine resources	S	Political boundary	square kilometer
		4- Length of Coastline	Is there any annual change in coast line?	S	Length of coast	kilometers
		5- Total annual Marine Fish production	Is there any depletion of living Marine resources? and What is the trend?	S	Annual catch by Major Species	metric tons/year
		6- Concentration of Petroleum Hydrocarbon	How oil pollution is affecting marine environment?	S	Petroleum Hydrocarbon	ppm

*UNEP/DEWA-ROWA Regional Workshop on Priority Environmental Indicators for West Asia/Arab Region. Bahrain, 13-15 October 2003

Table (Contd...)

	1- Marine pollution	7- Concentration of Algae/ eutrophication	Is there a change in nutrients levels	S	Algae level nutrients levels (N, P)	mg/cubic meter mg/liter
	2- Deterioration of Coral Reefs	8- Degree of Threat to Coral Reef	Condition and trend of depletion	P/I	- Area of coral - Coral bleaching % - No. of predator	High/medium/ low
	3- Coastal degradation	9- Average annual sediment load	Change in coastal characteristics	S	volume of sediments	ton/year
	4- Marine Litter & Solid Waste	10- Average annual waste disposal (land based/ sea based sources)	How the various activities are affecting the coastal/marine environment.	S	industrial / domestic / agricultural waste	ton/year
BIODIVERSITY	1- Degradation of ecosystem	Area of selected key ecosystems	Effectiveness of conservation measures	R/S	Area	ha/km^2
		Protected area as percent of total area	Effectiveness of conservation measures	R	Area	%

Table (Contd...)

		Abundance/density of selected key species	Status of key species	S	Number/Area	number/mass per unit area
	2- Loss of species	Percentage of threatened species	Status of fauna and flora	S	Number	%
	3- Alien (invasive) species	Number of alien (invasive) species	Status of fauna and flora	S	Number	number/area
	4- Management of biodiversity	Number of specialists in biodiversity conservation Per Number of selected key ecosystems	Efficiency of management systems	S	Number	number
		Percentage of annual budget allocated for biodiversity issues	Efficiency of management systems	S	Amount	%
		Number of ex-situ sites allocated for biodiversity conservation	Efficiency of management systems	S	Number	number
		Public awareness	Efficiency of management systems	R	Number of awareness programs (e.g. lectures, booklets, etc)	number
			Number of Biosphere Reserves	R	Sustainability of Conservation	number

The importance of integrated analysis of environmental trends and policies has been highlighted by UNEP in its documentation on GEO methodology to prepare the status of environment and a summary of that articulation is attached herewith as Annex i for reference. As a cross reference and further reading material, the NIEAR Guidelines for Africa on PSIR framework has also been given as an attachment to this document in Annex II. Further, the approved 'GEO Data-Indicators Matrix' is provided as Annex III to this document as a reference for facilitating global outlook in the context of the indicator matrix derived for ROPME Region. A useful glossary of terms used in GEO, as given in http://www.unep.org/geo/geo3/english/604.htm may be useful as cross reference in preparing National Report.

Process of reportage and responsibilities

The process of reportage and responsibilities within each Member State needs to be meticulously charted since the preparation of National Report could become an exercise of coordination of many elements over time. Following is the suggested methodology to accomplish this task.

- Preparation of a comprehensive list of institutions and experts who bear potential to contribute to the process of preparation of national report
- Distribution of ROPME SOMER Guidelines to the potential list
- Conduct of ROPME workshop to train the National contributors on the Guidelines, formats of data collection, DPSIR connectivity, etc.
- Collection and compilation of the information from contributors and preparation of the draft National Report and review by NFP and ROPME
- Review of the draft National Report by NFP and ROPME
- Finalization of the National Report, publication, distribution and submission to ROPME for incorporation into SOMER

Process of preparation of ROPME SOMER

In order to maintain consensus amongst the Member States on the information published in SOMER and also in order to authenticate the interpretations, the process will have to be as consultative and participatory as possible. Following is the suggested methodology to accomplish this task.

- Receiving inputs in formats and the finalized National Reports at ROPME
- Analysis of information and preparation of draft SOMER by a Regional working group of experts
- Regional Consultative Meeting to review the SOMER
- Finalization of ROPME SOMER, publication and distribution

III. Outline of Content/Chapters of SOMER

Chapter	Title	Content
	Table of Contents	
	Foreword	
	Acknowledgements	
	Executive Summary	
	Abbreviations and Acronyms	Short explanation of the abbreviations and acronyms
	List of Tables and Figures	Annotated guide to the tables and figures in the document
1	Introduction	• Background • Brief description of the chapters of SOMER • Overview of the setting of the RSA • Methodology of environmental assessment • Target groups identified by the report • Key focus areas of SOMER
2	Socio-economic interface in RSA	The development of key environmental drivers and pressures in the RSA. Features and issues related to: • Demography • Human development • Economic development • Consumption • Others
3	State and trends in the marine environment	• Environmental characteristics, land-sea interaction • Marine resources • Environmental degradation, episodic events and major disasters
4	Inter-linkages	• Integrated analysis of environmental trends for each priority environmental issue in the context of DPSIR, including intra and inter-linkages within and between environmental change and human dimension.
5	Challenges and opportunities	• Environmental vulnerability • National, Regional and Global responses • Science and technology • Capacity building • Environmental Governance • Others

6	Emerging issues	• Environmental • Institutional • Governance and Protocol related • Others
7	Future outlook of RSA	• Cross cutting aspects of drivers and environmental issues and the need for scenarios • Scenarios
8	Policy options for RSA	• Policy landscape • Analysis of existing Regional and National policy goals and targets • Linkages with WSSD, MDGs, Agenda 21, etc • Strategies and action plans at national and Regional levels • Emerging policy trends • Key policy messages and options, key actions and means of implementation • Identification of specific targets
	References	

IV. Detailed Description of Minimum Required Data/Information to Generate National Inputs for the Preparation of SOMER

It is required that only quality assured data/information be used for the preparation of the National Reports.

Chapter number	Chapter title	Format number	Format title	Page
1	Introduction	1.1	Geomorphological map(s) in 1:50,000 for the present and past	17
		1.2	Bathymetric map in 1:50,000	18
		1.3	Satellite composites of the Region	19
2	Socio-economic interface in RSA	2.1	Population distribution and temporal growth (%) in the country and the coastal provinces (past ten years)	20
		2.2	Urban sprawl in the coastal area	21
		2.3	Annual statistics of land and sea-based activities	22
		2.4	Annual socio-economic statistics	23
		2.5	Statistics of major industries and industrial production	24
		2.6	Estimates of industrial liquid wastes	25
		2.7	Estimates of industrial atmospheric emissions for the past ten years	26
		2.8	Estimates of domestic wastewater/liquid wastes	27
		2.9	Estimates of domestic solid wastes	28
		2.10	Contamination by way of marshland, riverine and agricultural land runoff	29
		2.11	Statistics on coastal development and physical alteration	30
		2.12	Photographs/ satellite images/ maps of coastal development and physical alteration	31

		2.13	Annual statistics of artisanal and industrial fish landings and types	32
		2.14	Fisheries resource exploitation	33
		2.15a	Sources of contaminants from offshore activities	34
		2.15b	Estimates of contaminants/litter from mariculture and fishing activities	35
		2.16	Radioactivity in RSA	36
		2.17	Sources of contaminants from transport	37
		2.18	Contaminants from coastal activities as measured at discharged point	38
		2.19	Litter, tar balls, etc. in the coastal zone	39
3	State and trends in the marine environment	3.1	Meteorological and related parameters (provide range with seasonal mean in bracket) for the past ten years	40
		3.2	Satellite images/ field photographs/ maps of dust storms and their effects	41
		3.3	Mean of physical oceanographic parameters	42
		3.4	Satellite images/ photographs/ maps/ associated information on upwelling, eddies, etc.	43
		3.5	Mean of chemical oceanographic parameters in coastal water	44
		3.6	Satellite image/ field photograph/ maps/ graph or any associated information on coastal and submarine geology including mineral distribution	45
		3.7	Range and mean of pathogenic bacteria in seawater	46
		3.8	Range and mean of phytoplankton production (Total cell count) for the past ten years	47
		3.9	Range and mean of zooplankton and ichthyoplankton abundance (Nos/m^3)	48

		3.10	Range and mean of macro and meiobenthos abundance	49
		3.11	Satellite image/ field photo/ map of phytoplankton blooms, red tide and pigment concentration, zooplankton & ichthyoplankton distribution	50
		3.12	Maps/ graphs of distribution / specimen photographs of phytoplankton, zooplankton, ichthyoplankton and benthos	51
		3.13	Location of specific species, biomass, area coverage and associations of major coastal marine habitats (mangroves, coral reefs, seagrass/ seaweed, sabkhas, mudflats, river deltas, marshlands, etc.) indicating the trend of stress and degradation	52
		3.14	Characterization of protected areas in terms of location, coverage, composition, significance, stress, status and actions	53
		3.15	Satellite images/ maps/ graphs/ field photos of major marine habitats	54
		3.16	Maps/ photographs of protected areas	55
		3.17	Range and mean of the composition and abundance (nos. per unit area) of invertebrate groups	56
		3.18	Range and mean of the composition and abundance (nos. per unit area) of vertebrate groups	57
		3.19	Maps/ field photos/ graphs, etc., of distribution of coastal and marine living resources	58
		3.20	Distribution and estimate of petroleum, gas and minerals and/or other coastal and marine non living resources	59
		3.21	Maps/ field photos/ trend graphs for the past ten years, etc., of distribution and estimates of coastal and marine non living resources	60
		3.22	Level of contaminants in nearshore waters, sediments and biota	61
		3.23	Maps/graphs of the distribution of the contaminants	62
		3.24	Level of contaminants in offshore waters, sediments and biota	63

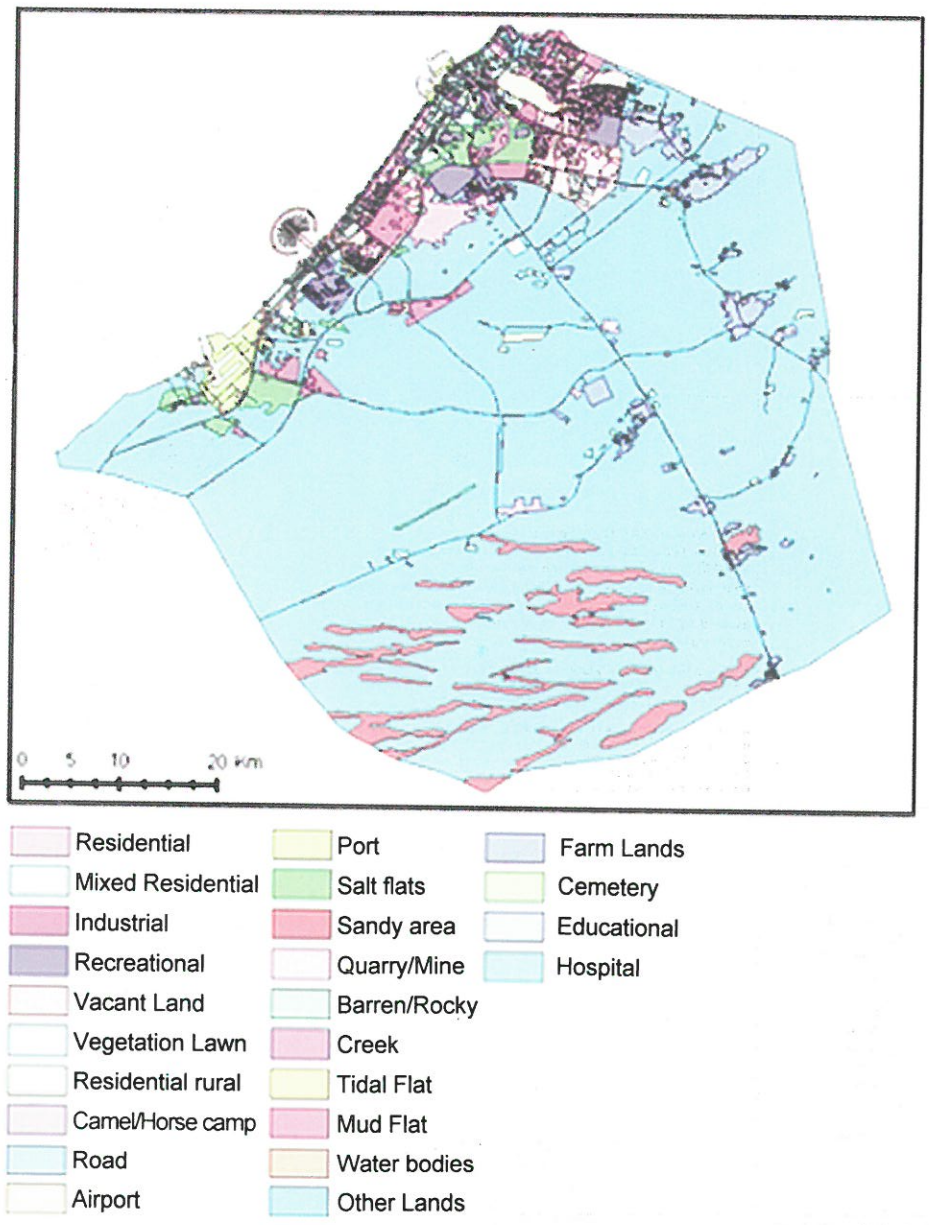
		3.25	Map of ROPME Oceanographic cruise stations	64
		3.26	National permissible standards of trace elements and contaminants in treated effluents, seawater, sediment and biota	65
		3.27	Extent (pictures, images, maps, graphs), type and impact of pollution caused by the wars/ skirmishes, tanker accidents or such large scale human impacts	66
		3.28	List and details of tanker accidents and major episodic events for the past ten years	67
		3.29	Details of mass mortality of marine organisms and related drivers for the past ten years	68
		3.30	Socio-economic aspects of marine mortality for the past ten years	69
		3.31	Extent (pictures, images, maps, graphs), type, cause and impact of mass mortality of marine organisms	70
		3.32	List and details of Invasive/alien marine species	71
		3.33	Distribution (pictures, images, maps, graphs), species, cause and impact of the invasion by alien marine species	72
4	Inter-linkages	4.1	Integrated analysis of environmental trends and policies (DPSIR)	73
		4.2	Brief appraisal of national integrated assessment on marine environment (Indicators of DPSIR identified for the assessment)	74
5	Challenges and opportunities	5.1	National capacity in terms of institutions, inter institution framework and programmes for sustainable development and environmental management	75
		5.2	Archetypes of vulnerability	76
6	Emerging issues	6.1	Emerging environmental issues related to coastal marine activities, e.g. chronic oil pollution, sprawling urbanization along the coast, degradation of major habitats, contamination, conservation and restoration of marshlands, radiological hazard, etc.	77
7	Future outlook of RSA		No specific format is suggested since the chapter has to evolve from meticulous synthesis of information of diverse nature.	

8	Policy options for RSA	8.1	Brief appraisal of ROPME Protocols and Programme (Updated information, if any)	84
		8.2	Brief appraisal of relevant national legislation/ framework/ guidelines, environmental strategies, etc.	85
		8.3	Status of ratification of Kuwait Regional Convention and its Protocols by the Member States (Updated information, if any)	87
		8.4	Status of ratification of ROPME Member States in international environmental agreements	88
		8.5	List of recommendations from various national and international framework processes at the Member State level	89
		8.6	List of recommendations from various Regional and international framework processes concerning the RSA	90

The detailed matrixes of above mentioned formats of inputs (Format Nos. 1.1– 8.6) necessary for the preparation of the National Report on the State of the Marine Environment are depicted in the following pages. It is to be noted that the detailed formats are indicative but may not be 'all inclusive'. It is expected that the Member States energise their internal resources to compile information on the lines of these formats as an essential background work to preparing the national reports. While doing so, it will be desired that the National Reports include as many case studies, success stories and examples as possible. ROPME requires the integrated National Reports as inputs to SOMER but will also appreciate to receive the data/information in the suggested formats.

1.1 Geomorphological map in 1:50,000 for the present and past

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the various geomorphological features of the coastal area of the Member State. If 1:50,000 scale map is not available, any available scale showing the features in good clarity can be provided. An example of geomorphological map is given below for reference.

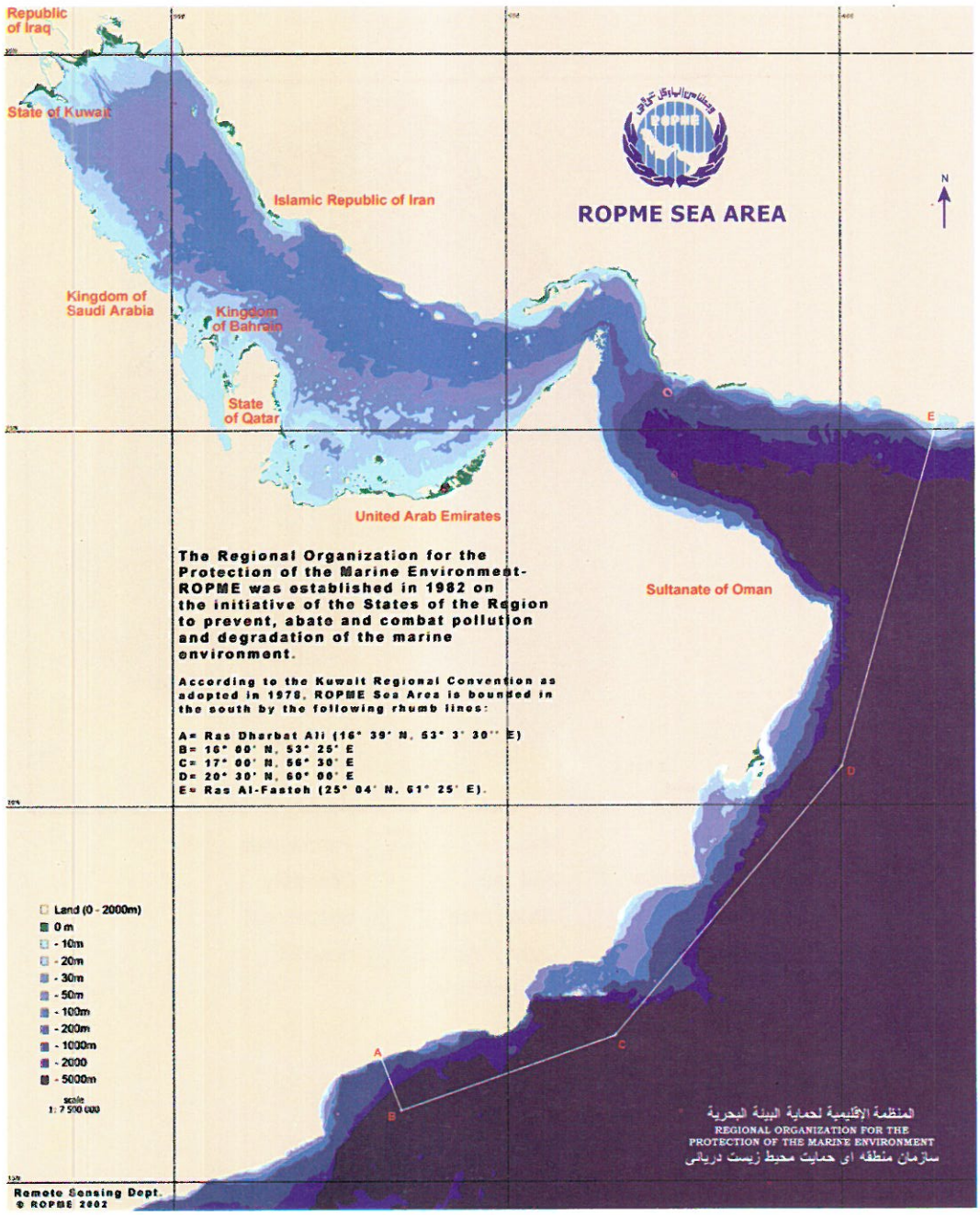


Geomorphological map of Dubai, UAE

NB: Source/reference and credits of data to be clearly mentioned

1.2 Bathymetric map in 1:50,000

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the bathymetric features of the coastal area of the Member State. If 1:50,000 scale map is not available, any available scale showing the features in good clarity can be provided. An example of bathymetric map is given below for reference.

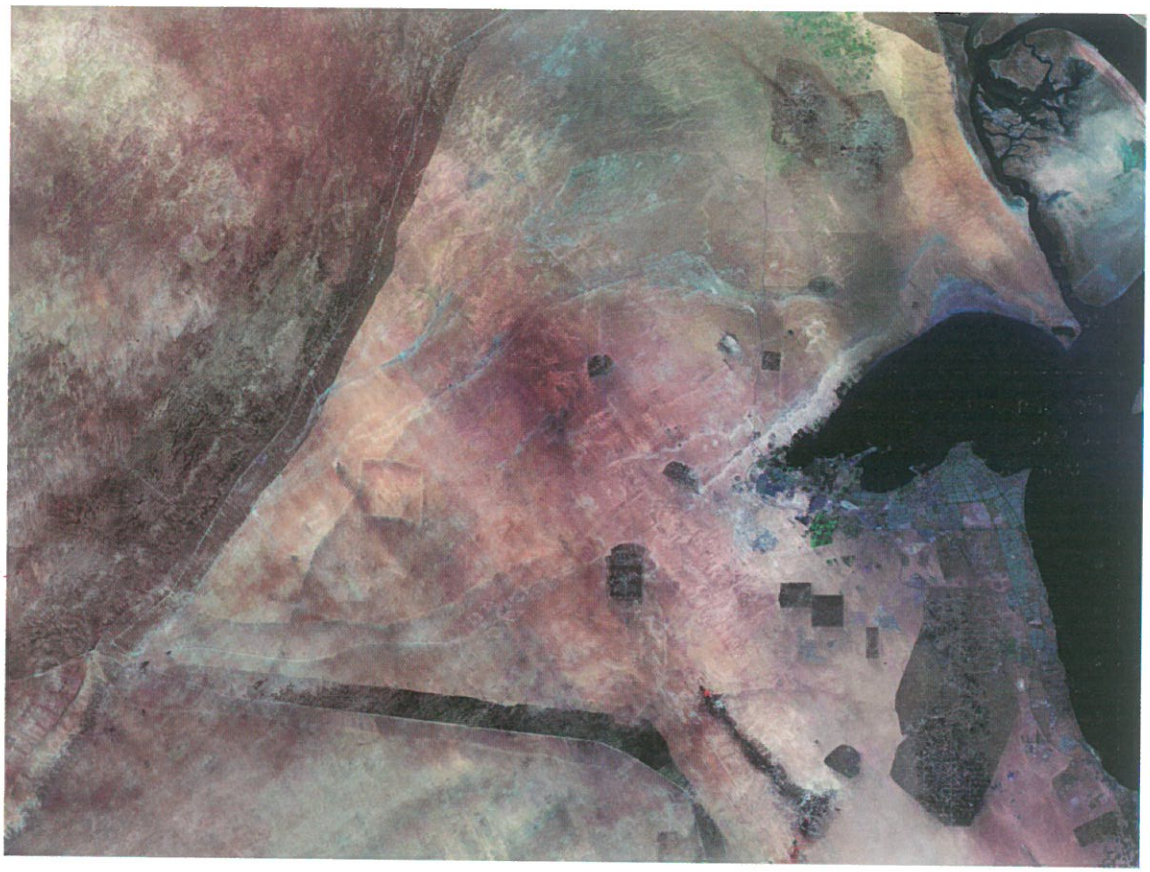


Bathymetric map of ROPME Sea Area

NB: Source/reference and credits of data to be clearly mentioned

1.3 Satellite composites of the Region

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the important features of parts of the coastline. Any resolution or multiple spatial resolutions can be used depending on the available source. An example of a satellite image composite is given below for reference.



Satellite image of a part of Kuwait

NB: Source/reference and credits of data to be clearly mentioned

2.1 Population distribution and temporal growth (%) in the country and the coastal provinces (past ten years)

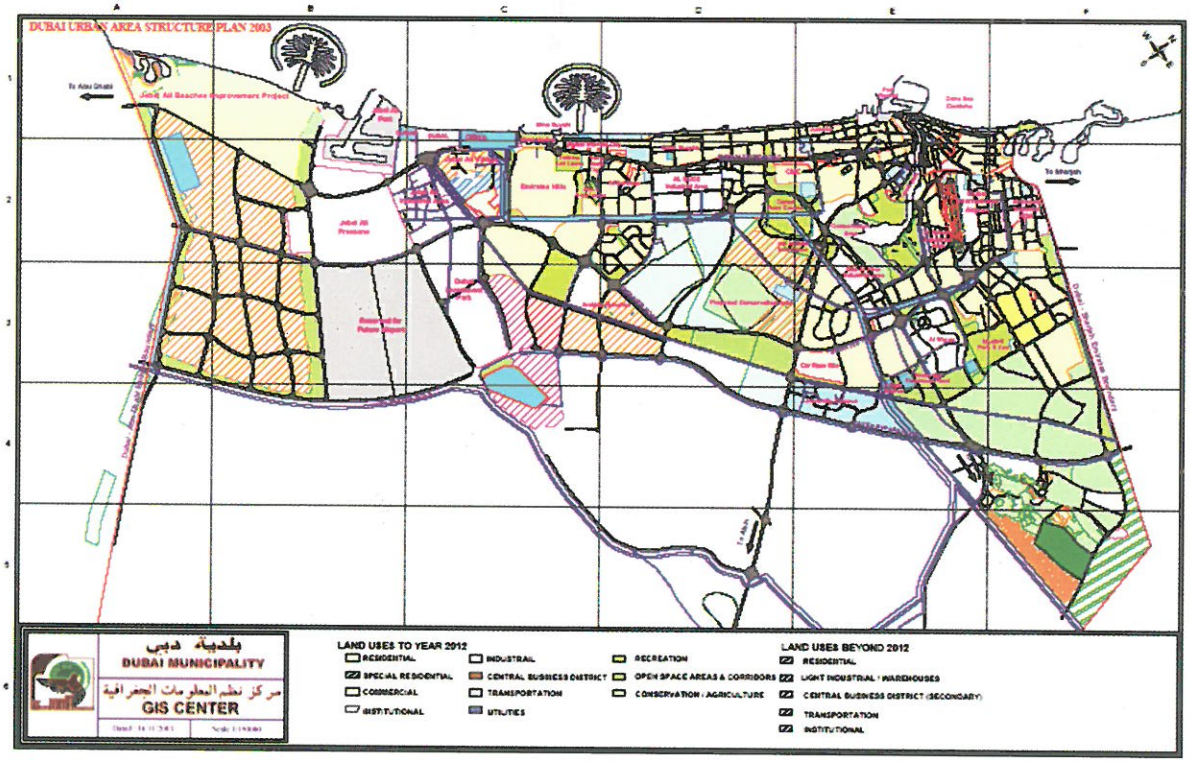
Country: _____ Year: _____

Item	10 years ago		5 years ago		Present	
	Population	Growth (%)	Population	Growth (%)	Population	Growth (%)
Total country population						
Total population in the coastal zone						
Population in the coastal provinces: • • • •						
Population in the major coastal cities, towns by name: • • • •						

NB: Source/reference and credits of data to be clearly mentioned

2.2 Urban sprawl in the coastal area

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the urban sprawl of the different coastal areas. If master plans of development are available, they may be provided. An example of a satellite image composite is given below for reference.



Satellite image of the coastal urban sprawl of Dubai

NB: Source/reference and credits of data to be clearly mentioned

2.3 Annual statistics of land and sea-based activities*

Country: _____ Year: _____

Item	Production (as applicable)	
	Quantity	Income (mill US$)
Agriculture		
Aquaculture		
Fisheries		
Offshore oil mining		
Onshore oil mining		
Offshore gas mining		
Onshore gas mining		
Petrochemical industries		
Refineries		
Desalination plants		
Power plants (electricity)		
Other minerals and chemicals (specify)		
Port and harbour • Import • Export		
Tourism		

* Trends chart of each component for the past ten years

NB: Source/reference and credits of data to be clearly mentioned

2.4 Annual socio-economic statistics*

Country: _____ Year: _____

Item	Detail
GDP (US$)	
GDP components (%) • Agriculture & fisheries • Industries • Services	
GNP (US$)	
Per capita income (US$)	
Literacy (%) • Male • Female	
Longevity (years) • Male • Female	
Annual Birth rate	
Annual Mortality	
Annual Infant mortality	
Male/female ratio in population	

* Trends chart of each component for the past ten years

NB: Source/reference and credits of data to be clearly mentioned

2.5 Statistics of major industries and industrial production*

Country: _____ Period: _____

Year	Type of industry	Location / Industrial Area	Type of product	Quantity of production (specify unit of estimate)

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

2.6 Estimates of industrial liquid wastes*

Country: _____

Year	Source	Location	Discharge (m^3/yr)	Contaminants load (t/yr)									Microbial[2]	Treatment Type and Level
				BOD	COD	SS	TDS	OG[1]	N	P	Total Chlorine	Trace Metals & Others		

[1]Oils and Grease

[2]Specify type and load of microbial contamination

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

2.7 Estimates of industrial atmospheric emissions for the past ten years*

Country: _____

Year	Sources	Location	Contaminants load (t/yr)						Treatment type and level	Management (Level of effectiveness)
			NO_x	SO_x	Particulates	CO	HC	Others		

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

2.8 Estimates of domestic wastewater/liquid wastes*

Country: _____

Year	Location	Flow (m^3/d)	Population served	Design Capacity (m^3/d)	Contaminants load									Marine effluent discharge		Management (Level of effectiveness)
					BOD (mg/l)	COD (mg/l)	SS (mg/l)	TDS (mg/l)	N (µg/l)	P (µg/l)	Total Chlorine	Microbial*	Others	Raw (%)	Treated (%)	

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

2.9 Estimates of domestic solid wastes*

Country: _____

Year	Source	Location	Type and Composition	Production (t/yr)	Waste Management Practices

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

2.10 Contamination by way of marshland, riverine and agricultural land runoff

Country: _____ Year*: _____

Name of marshland / river / stream/ any other source (such as land runoff point): _____

Measurement Location: Lat.: _____°N Long.: _____°E Period: _____

Parameters	No. of observations	Min	Max	Mean
Water Discharge (km^3/yr) Suspended Solids (mg/l)				
BOD_5 (mg/l)				
COD (mg/l)				
Nutrients (µg/l) Other (µg/l) <u>Heavy metals</u>: Mercury (µg/l) Cadmium (µg/l) Lead (µg/l) Other (µg/l) Total Hydrocarbons (mg/l)				
<u>Organo-chlorines</u>: PCBs (ng/l) DDT (ng/l) Lindane (ng/l) Other (ng/l)				
Pathogens (colonies/100ml) Other Contaminants (µg/l)				

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

2.11 Statistics on coastal development and physical alteration*

Country: _____ Location: Lat.: _____°N Long.: _____°E Period: _____

Category	Information
Land Reclamation:	
Extent of filling:	
- Area (km^2)	
- Length of coastline affected (km)	
- Type of fill material used	
- Quantity (m^3 or tonnes)	
- Habitats affected (Nature & extent)	
- Marine biotopes affected	
Port, harbour and seafront development:	
- Area (km^2)	
- Length of coastline developed (km)	
- Type of marine/offshore construction	
- Quantity (m^3 or tonnes)	
- Type of construction material	
- Filling / Removal	
- Volume (tonnes)	
- Type of materials	
- Source/destination of fill materials	
- Habitats affected (Nature & extent)	
- Marine biotopes affected	
Dredging:	
- Area dredged	
- Type of Dredged Materials	
- Location of Disposal	

*Provide trend chart of the past as available whenever possible

NB: Source/reference and credits of data to be clearly mentioned

2.12 Photographs/ satellite images/ maps of coastal development and physical alteration

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the above feature with details. An example is given below for reference.

Satellite image of Muscat showing urban influences on Qurm mangrove area

NB: Source/reference and credits of data to be clearly mentioned

2.13 Annual statistics of artisanal and industrial fish landings and types*

Country: _____

Year	Fish landing	Fishing craft & gear / Culture Method	Groups / Species	Annual Catch / Production (10^3 t/yr) in the past 10 years										Fisheries Management / Legislation (e.g. closed seasons, area, etc.)
				1 (current year)	2	3	4	5	6	7	8	9	10 (Ten years ago)	
	Artisanal													
	Industrial													
	Aquaculture													
	Total													

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

2.14 Fisheries resource exploitation*

Country: _____ Year: _____

Standing stock (Group/Species)	Level of exploitation (Over/Under)	CPUE (Catch Per Unit Effort)	MSY (Maximum Sustainable Yield)	Status of biodiversity (Endangered/Threatened/ Regulated, etc.)	Changes in fish landing composition	Any other relevant information
Pelagic resource • • • • • • Demersal resource • • • • • •						

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

2.15a Sources of contaminants from offshore activities*

Country: _____ Area/Location: _____ From: _____ To: _____

Sources	Quantity (t/yr)	Parameters				
		BOD/COD	Nutrients	Trace metals	Hydrocarbons	Others (specify)
Oil and Gas Exploration, Exploitation and Production: - Drilling muds - Drill cuttings - Produced water - Oily wastes - Solid wastes - Sewage - Others (specify) Natural Seepage						

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

2.15b Estimates of contaminants/litter from mariculture and fishing activities*

Country: _____ Area/Location: _____

From: _____ To: _____

Sources	Types of contaminants/ litter	Quantity	Remarks
<u>Mariculture activities:</u> • Feed related • Disease treatment related • Structure/cage related • Others <u>Fishing activities:</u> • Gear related • Craft related • Discard related • Others			

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

2.16 Radioactivity in RSA*

Country: _____ Location: _____ Period: _____

Contaminants	Water		Sediment		Biota	
	Range (Bq/l)	Mean (Bq/l)	Range (Bq/Kg)	Mean (Bq/Kg)	Range (Bq/Kg)	Mean (Bq/Kg)
Radionuclides: ^{137}Cs ^{226}Ra ^{232}Th ^{238}U $^{239\text{-}240}Pu$ ^{7}Be ^{40}K ^{241}Am - - - others						
Radiation**: Alpha α Beta β Gamma δ						

*Provide trend chart of the past as available
** Specify unit

NB: Source/reference and credits of data to be clearly mentioned

2.17 Sources of contaminants from transport*

Country: _____ Year: _____

Mode of transport (vessel/ pipeline, etc.): _____

Name of Port/Terminal: _____ Port: _____ Terminal: _____

Type	Origin or Destination	Quantity handled (m^3/yr or t/yr)	Amount spilled into the sea (m^3/yr or t/yr)	Date of spill	Management / Action taken
Crude Oil					
Petroleum Products (specify)					
Chemical Bulk (specify)					
Ballast water					
Hazardous Wastes (specify)					
Others (specify)					

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

2.18 Contaminants from coastal activities as measured at discharged point*

Country: _____ Area/Location: Lat.: _____ °N Long.: _____ °E

Year: _____

Contaminants	Type of activity	Frequency and rate of discharge/disposal	Concentration (specify unit**)		Annual total amount of discharge/disposal
			Range	Mean	
Metals: - Mercury - Cadmium - Lead - Copper - Chromium - Nickel - Vanadium - Others (specify)					
Petroleum Hydrocarbons - Total - Selected group (specify) - Others (specify)					
Organo-chlorines (ng/l): - PCBs - DDTs - Lindane - Others (specify)					

*Provide trend chart of the past as available

**Concentration in sea water in µg/l or mg/l; in sediment (mg/kg) dry wt., and in biota (mg/kg) dry weight.

NB: Source/reference and credits of data to be clearly mentioned

2.19 Litter, tar balls, etc. in the coastal zone*

Country: _____

Period	Location	Type	Country Average	
			Quantity (kg/m^2)	Area covered (m^2)

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

3.1 Meteorological and related parameters (provide range with seasonal mean in bracket) for the past ten years

Country: _____ Location: _____

Period	Air Temperature (°C)	Atmospheric Pressure (mb)	Relative Humidity (%)	Wind Speed (m/sec)		Dust Fallout (kg/km^2)	Duration of dust storm		Evaporation (cm/yr)	Rainfall (mm)	Land runoff (m^3/sec)
				Range	Mean		Hrs/day	Month			

* Trends chart of each component for the past ten years

NB: Source/reference and credits of data to be clearly mentioned

3.2 Satellite images/ field photographs/ maps of dust storms and their effects

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the dust storm and its effect. A satellite image or a field photograph or a graph or map depicting the effect in some form may be provided with details. An example is given below for reference.

Satellite image of dust storm in the RSA

NB: Source/reference and credits of data to be clearly mentioned

3.3 Mean of physical oceanographic parameters

Country: _____ Location: _____

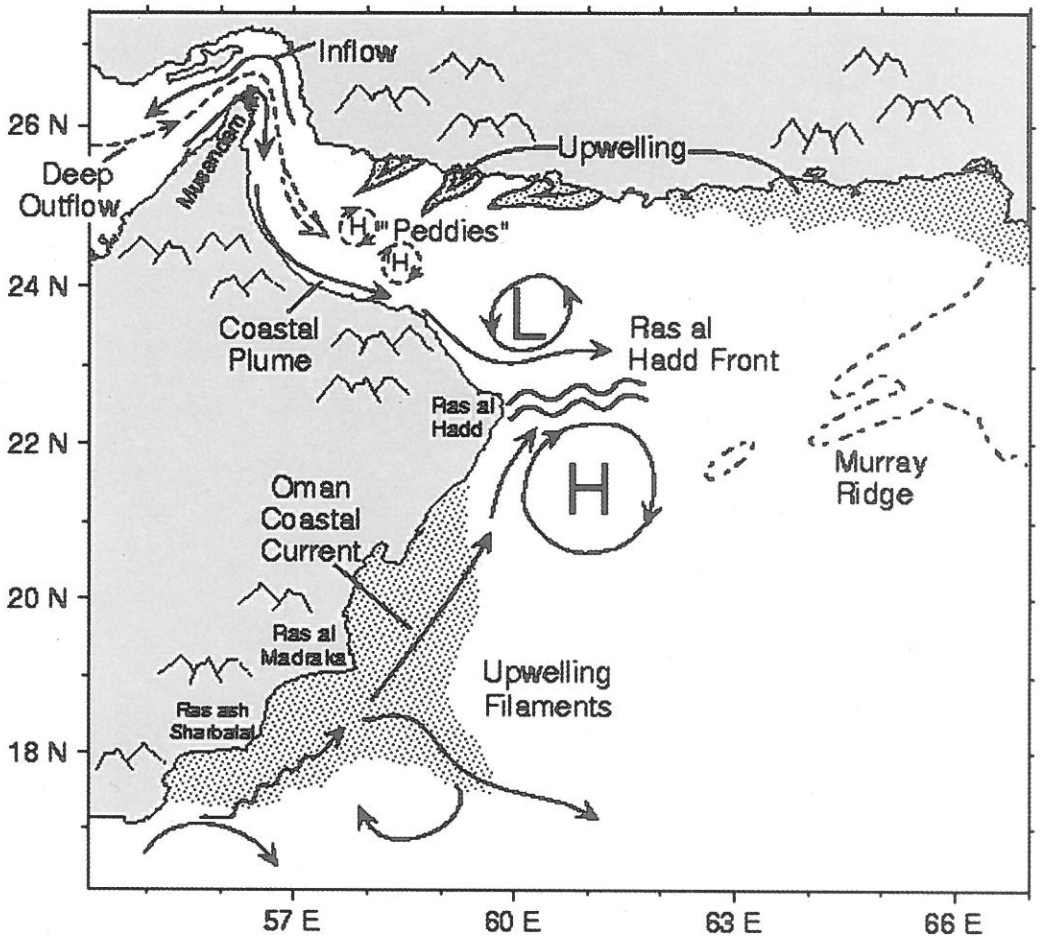
Period	Depth (m)	Sea Level	Wave Height	Transparency	Water Temperature (°C)	SPM (g/L)	Current speed (cm/sec)

*Values reported should be yearly range and mean for a period of last ten years.

NB: Source/reference and credits of data to be clearly mentioned

3.4 Satellite images/ photographs/ maps/ associated information on upwelling, eddies, etc.

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the important physical oceanographic feature with details. An example is given below for reference.



Physical oceanographic features of the RSA

NB: Source/reference and credits of data to be clearly mentioned

3.5 Mean of chemical oceanographic parameters in coastal water *

Country: _____ Location: _____

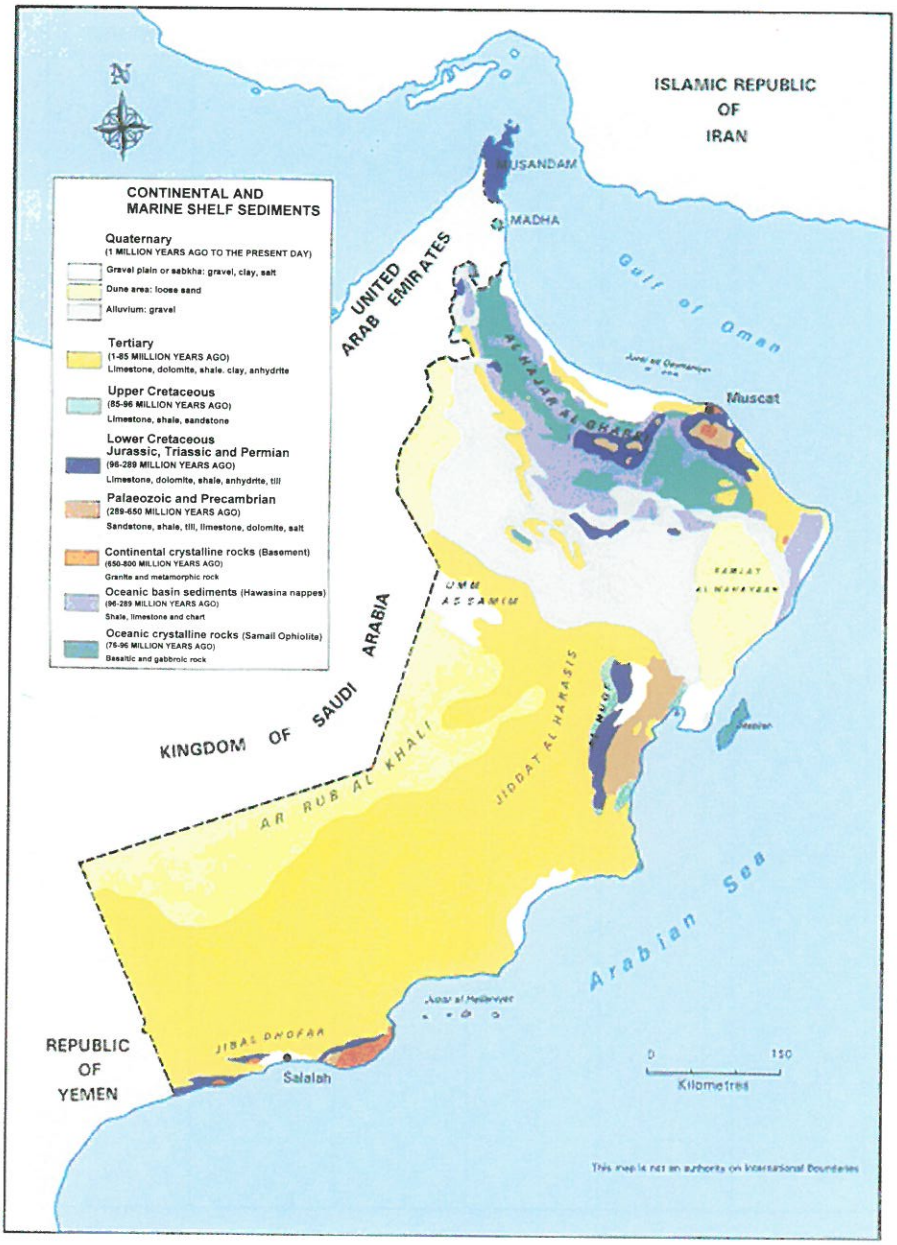
Period	Depth (m)	Salinity (ppt)	TOC (g/L)	TON (g/L)	TOM (g/L)	pH	DO (mg/L)	PO_4 (µg/L)	NH_3 (µg/L)	NO_3 (µg/L)	NO_2 (µg/L)	SiO_3 (µg/L)	H_2S (µg/L)

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

3.6 Satellite images/ field photographs/ maps/ graph or any associated information on coastal and submarine geology including mineral distribution

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the above feature with details. An example on the geology of the Sultanate of Oman is given below for reference.



Geology of the Sultanate of Oman

NB: Source/reference and credits of data to be clearly mentioned

3.7 Range and mean of pathogenic bacteria in seawater*

Country: _____ Location: _____

If the sample type is sediment or biota, specify CFU/g.

Period	Total coliform (CFU/100 ml)		Faecal coliform (CFU/100 ml)		Faecal streptococci (CFU/100 ml)		Others (specify) (CFU/100 ml)	
	Range	Mean	Range	Mean	Range	Mean	Range	Mean

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

3.8 Range and mean of phytoplankton production (Total cell count) for the past ten years*

Country: _____ Location: _____

Sampling type (e.g.: net, bottle): _____

Period	Depth (m)	Chl-*a* concentration (mg/l)		Total cell count (No/l or No/m^3)	
		Range	Mean	Range	Mean

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

3.9 Range and mean of zooplankton and ichthyoplankton abundance (Nos/m^3)*

Country: _____ Location: _____

Sampling type (e.g.: surface/vertical tows): _____ Net mesh size (mm): _____

Period	Zooplankton			Ichthyoplankton				
	Species**	Range	Mean	Species	Eggs		Larvae	
					Range	Mean	Range	Mean

*Provide trend chart of the past as available.
**Specify invasive/alien species, if any

NB: Source/reference and credits of data to be clearly mentioned

3.10 Range and mean of macro and meiobenthos abundance*

Country: _____ Location:_____

Sampling type: _____

Period	Macrobenthos (nos/m^2)			Meiobenthos (nos/m^2)		
	Species	Range	Mean	Species	Range	Mean

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

3.11 Satellite image/ field photo/ map of phytoplankton blooms, red tide and pigment concentration, zooplankton & ichthyoplankton distribution

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the above feature with details. Some examples are given below for reference.

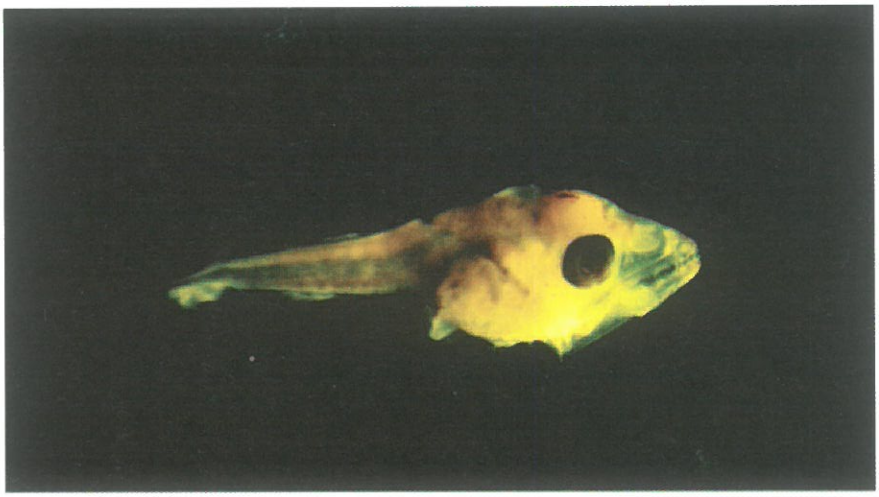
Red tide bloom

Green tide bloom

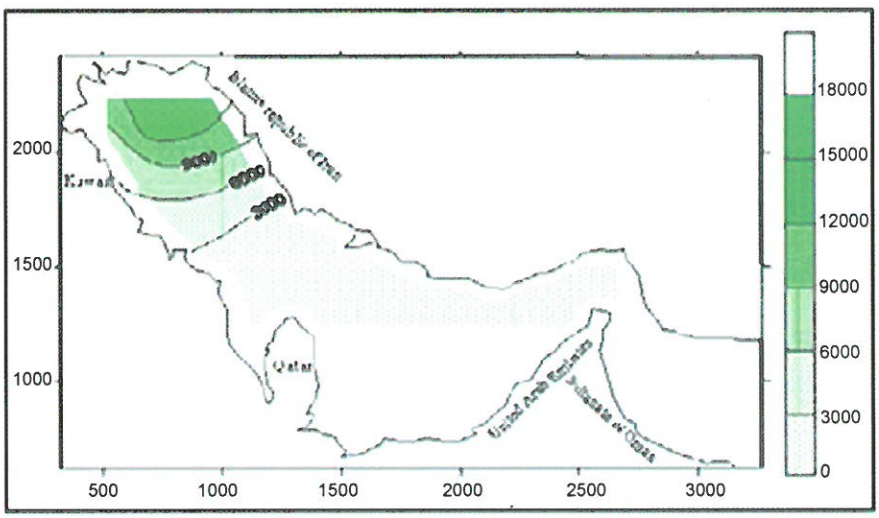
NB: Source/reference and credits of data to be clearly mentioned

3.12 Maps/ graphs of distribution / specimen photographs of phytoplankton, zooplankton, ichthyoplankton and benthos

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the above feature with details. Some examples are given below for reference.



Microscopic photograph of kingfish (*Scomberomorus commerson*) larva



Concentrations of phytoplankton (cells/l) in the RSA

NB: Source/reference and credits of data to be clearly mentioned

3.13 Location of specific species, biomass, area coverage and associations of major coastal marine habitats (mangroves, coral reefs, seagrass/ seaweed, sabkhas, river deltas, mudflats, marshlands, etc.) indicating the trend of stress and degradation

Country: _____

Year	Location name	Type of habitat	Centre coordinate	Area covered (km^2)	Characterization (community, associations, dominant species, etc.)	Stress factors	Status of degradation	Type of response

NB: Source/reference and credits of data to be clearly mentioned

3.14 Characterization of protected areas in terms of location, coverage, composition, significance, stress, status and actions

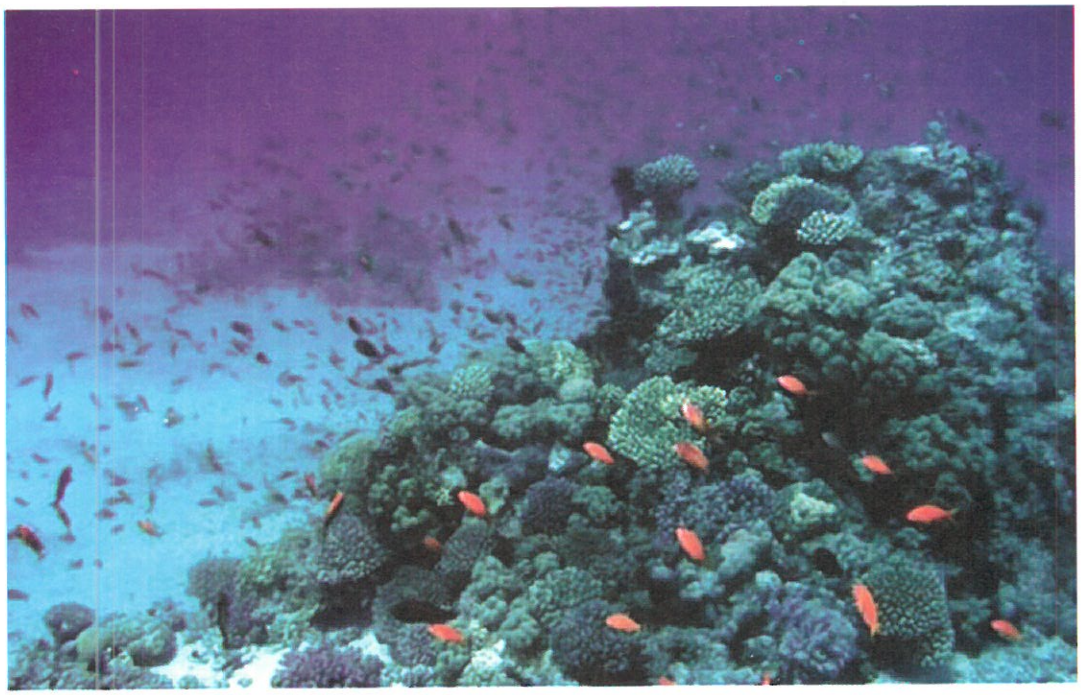
Country: _____

Year	Location name	Coordinates	Type of habitat	Status of protection (reference to decree, legislation, convention, etc.)	Area covered (km^2)	Characterization (community, associations, dominant species, etc.)	Continued stress factors, if any	Remarks

NB: Source/reference and credits of data to be clearly mentioned

3.15 Satellite images/ maps/ graphs/ field photos of major marine habitats

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the above feature with details. Some examples are given below for reference.



Coral reef ecosystem

Mangrove, *Avicennia marina*

NB: Source/reference and credits of data to be clearly mentioned

3.16 Maps/ photographs of protected areas

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the above feature with details. An example of Daymaniyat Island of Oman (Protected Area) is given below for reference.

Daymaniyat Island of the Sultanate of Oman

NB: Source/reference and credits of data to be clearly mentioned

3.17 Range and mean of the composition and abundance (Nos per unit area) of invertebrate groups (Please mark the Invasive/alien species with an asterix)*

Country: _____

Year	Sponges		Jelly fishes		Corals		Crustaceans		Molluscs		Echinoderms		Others	
	Species	Numbers	Species	Numbers	Species	Numbers	Species	Numbers	Species	Numbers	Species	Numbers	Species	Numbers

*Present status and trends chart for the past ten years

NB: Source/reference and credits of data to be clearly mentioned

3.18 Range and mean of the composition and abundance (nos per unit area) of vertebrate groups (Please mark the Invasive/alien species with an asterix)*

Country: _____

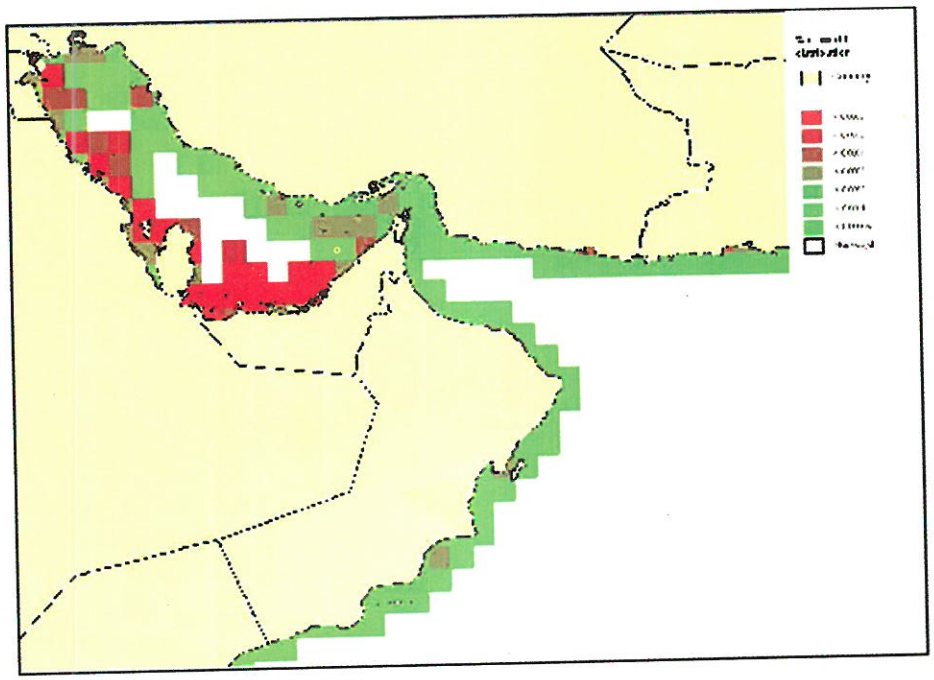
Year	Reptiles		Fishes		Birds (shore/sea)		Mammals		Others	
	Species	Numbers	Species	Numbers	Species	Numbers	Species	Numbers	Species	Numbers

*Present status and trends chart for the past ten years

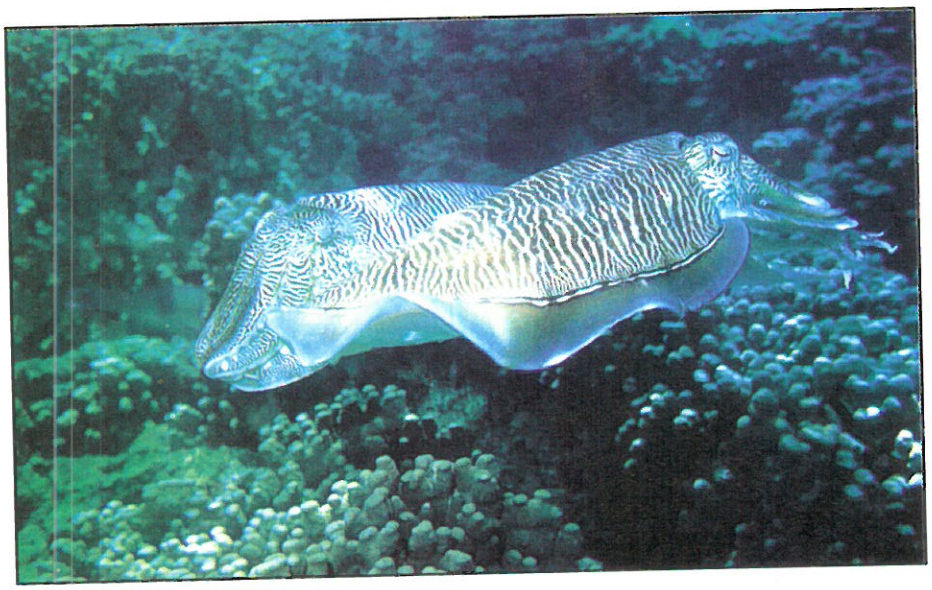
NB: Source/reference and credits of data to be clearly mentioned

3.19 Maps/ field photos/ graphs, etc., of distribution of coastal and marine living resources

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the above feature with details. Some examples are given below for reference.



Map on the distribution levels of living resources in the RSA



Pharaoh cuttlefish, *Sepia pharaonis*

NB: Source/reference and credits of data to be clearly mentioned

3.20 Distribution and estimate of petroleum, gas and minerals and/or other coastal and marine non living resources*

Country: _____

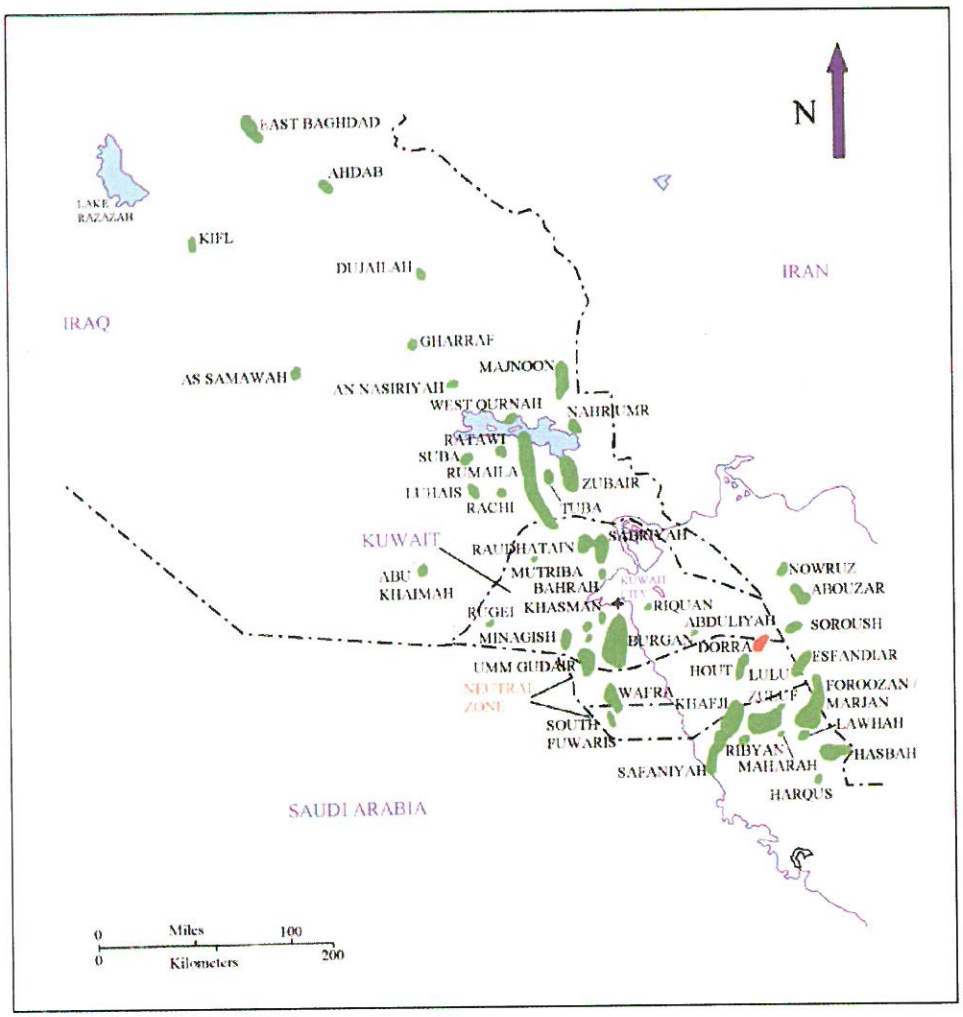
Period	Location name	Type of resource	Coordinates	Area covered (km^2)	Estimated quantity in reserve	*Rate of production	Status of exploitation	Any other remarks

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

3.21 Maps/ field photos/ trend graphs for the past ten years, etc., of distributon and estimates of coastal and marine non living resources

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the above feature with details. An example is given below for reference.



Map of oil fields in the Northern RSA

NB: Source/reference and credits of data to be clearly mentioned

3.22 Level of contaminants in nearshore waters, sediments and biota

Country: _____ Location: Lat.: _____ °N Long.: _____ °E

Sampling Depth: _____m Year: _____

Sample type (specify): Water: _____

Sediment: _____

Biota: _____

Contaminants	No. of observations	Concentration (specify unit**)	
		Range	Mean
Metals: - - - - - - -			
Petroleum Hydrocarbons - - -			
Organo-chlorines (ng/l): - - - -			
Others			

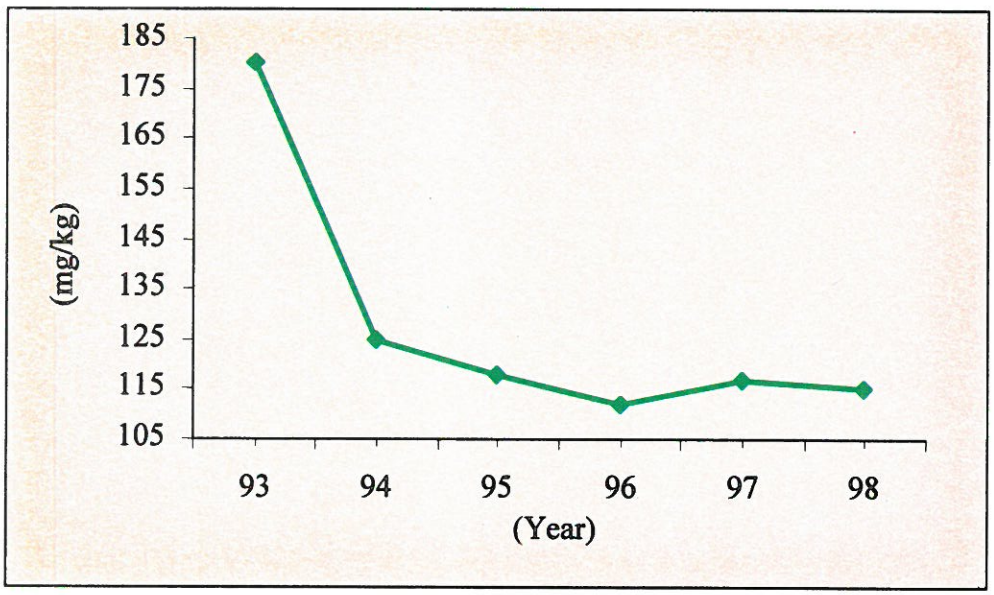
*Provide trend chart of the past as available

**(e.g.) Concentration in sea water (µg/l or mg/l), in sediment (µg/kg or mg/kg - dry wt.), and in biota (µg/kg or mg/kg - dry wt.)

NB: Source/reference and credits of data to be clearly mentioned

3.23 Maps/graphs of the distribution of the contaminants

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the above feature with details. An example is given below for reference.



Variation in petroleum hydrocarbons in sediment samples of Bahrain

NB: Source/reference and credits of data to be clearly mentioned

3.24 Level of contaminants in offshore waters, sediments and biota*

Country: _____ Year: _____

Contaminants	No. of observations	Concentration (specify unit**)	
		Range	Mean
Metals: - - - - - - - -			
Petroleum Hydrocarbons - - -			
Organo-chlorines (ng/l): - - - -			
Others			

*Provide trend chart of the past as available

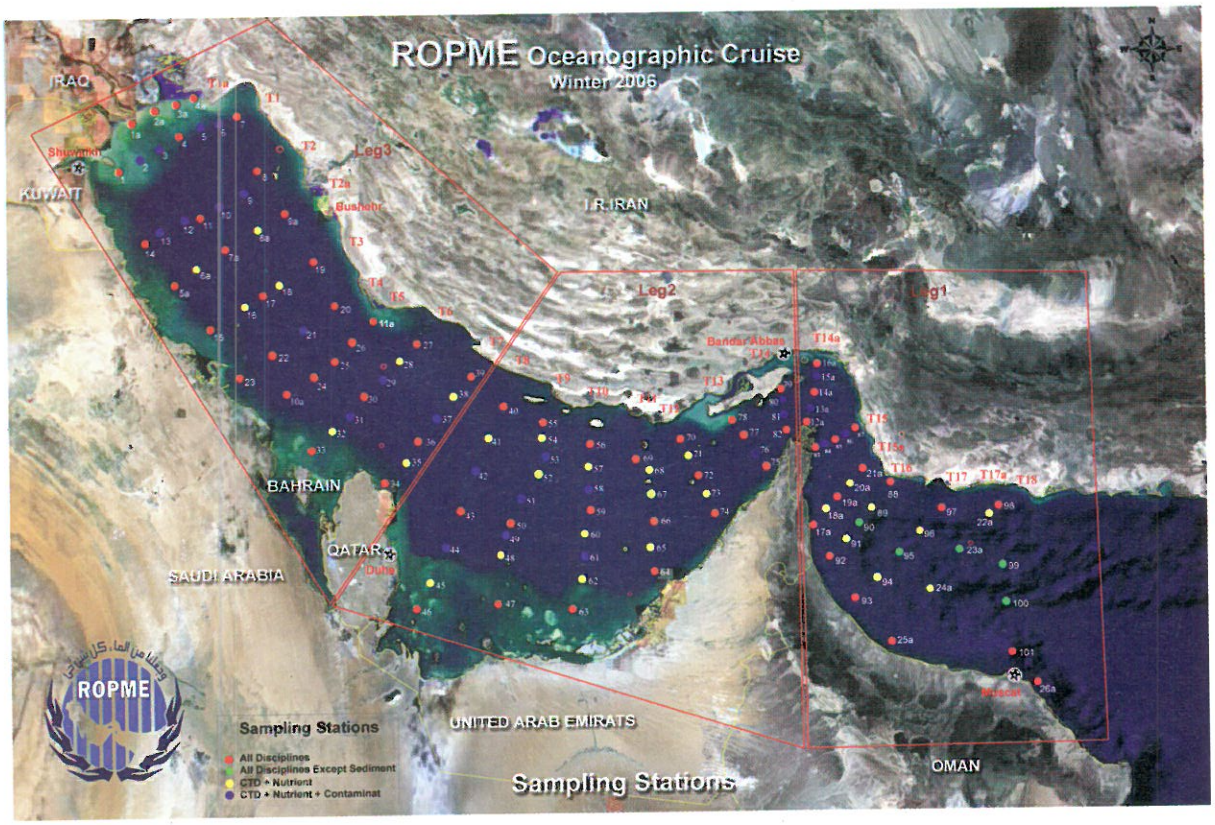
**(e.g.) Concentration in sea water (µg/l or mg/l), in sediment (µg/kg or mg/kg - dry wt.), and in biota (µg/kg or mg/kg - dry wt.)

*Provide trend chart of the past as available

NB: Source/reference and credits of data to be clearly mentioned

3.25 Map of ROPME oceanographic cruise stations

This map is provided as a reference for the selection of station numbers for preparing inputs in format 3.24.



ROPME Oceanographic Winter 2006 Cruise stations

NB: Source/reference and credits of data to be clearly mentioned

3.26 National permissible standards of trace elements and contaminants in treated effluents, seawater, sediment and biota*

Country: _____ Year: _____

	National standards (please specify unit)			
	Treated effluents	**Seawater**	**Sediment**	**Biota**
TOC				
Petroleum hydrocarbons: - - - -				
Pesticides: - - - -				
PCBs: - - - -				
Trace metals: - - - -				
Others				

*Alternatively corresponding documents/copies of legislations may be provided
NB: Source/reference and credits of data to be clearly mentioned

3.27 Extent (pictures, images, maps, graphs), type and impact of pollution caused by the conflicts, tanker accidents or such large scale human impacts

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the above feature with details. An example is given below for reference.

Oil well fire

NB: Source/reference and credits of data to be clearly mentioned

3.28 List and details of tanker accidents and major episodic events for the past ten years*

Country/Area: _____ Year: _____

Type	Source	Location (coordinates)	Quantity (m^3 or tonnes)	Nature of impact	Severity of impact	Response
- Crude oil spills - Oily wastes - Hazardous Chemical Spills						
Others						

- Separate report should be submitted on all such releases and accidents.
- If chemicals are used as response, name and quantity should be given.

NB: Source/reference and credits of data to be clearly mentioned

3.29 Details of mass mortality of marine organisms and related drivers for the past ten years[1, 2]

Country: _____ Year: _____

Phenomenon	Driver	Location	Date	Area covered (sq km)	Duration	Magnitude of the Incident	Control measures
- Mortalities of marine organisms (Number or Weight) Fishes: Others: - Unusual blooms of marine organisms (red tides and other algal blooms, eutrophication) (No./l) - Unusual microbial activities (Total coliform, vibrio, etc.) (Colony/100 ml) - Other events							

[1]Trends chart for the past ten years

[2]Separate report on all such events should be submitted.

NB: Source/reference and credits of data to be clearly mentioned

3.30 Socio-economic aspects of marine mortality for the past ten years*

Country: _____ Year: _____

A: Economic consequences of marine mortality

No.	Quantity of dead marine species (in kg or ton)		Estimated Value (Value/kg)				Total Value (US$)		Fish ban / Stopped fishing		Total economic loss (US$) as estimated		
			Average local market value (US$)		Export market value, if exported (US$)								
	Fish species	Other marine species	Fish species	Other marine species	Fish species	Other marine species	Fish species	Other marine species	Initial date	Final date	Fish species	Other marine species	Fish ban
1													
2													
3													
4													
5													

*Estimated loss of economy for the past ten years

B: Social Implications

	Please tick (√) Yes	No	Remarks
Stopped fishing			
Stopped consumption of fish			
Stopped recreation (swimming, snorkling, diving, etc.)			
Human illness reported			

	Please tick (√) Excellent	Good	Poor	Remarks
Media coverage of the event				
How factual was the media coverage?				

NB: Source/reference and credits of data to be clearly mentioned

3.31 Extent (pictures, images, maps, graphs), type, cause and impact of mass mortality of marine organisms

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the above feature with details. An example is given below for reference

Dead fish stranded along the beach

NB: Source/reference and credits of data to be clearly mentioned

3.32 List and details of invasive/alien marine species

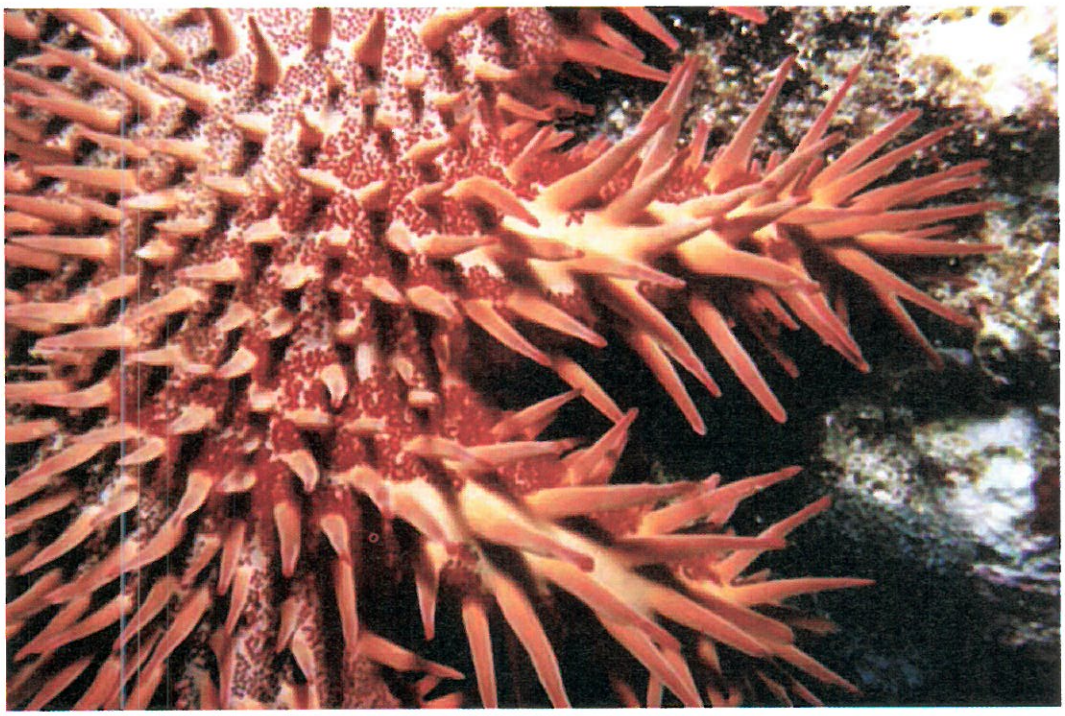
Country: _____ Year: _____

Invasive/alien species	Vector	Impact in the environment (please enclose reports if available)	Any other remarks

NB: Source/reference and credits of data to be clearly mentioned

3.33 Distribution (pictures, images, maps, graphs), species, cause and impact of the invasion by alien marine species

A hardcopy print and a digital image in any picture format (preferably in .jpg format), depicting the above feature with details. An example is given below for reference.



Crown of Thorns Starfish, *Acanthaster planci*

NB: Source/reference and credits of data to be clearly mentioned

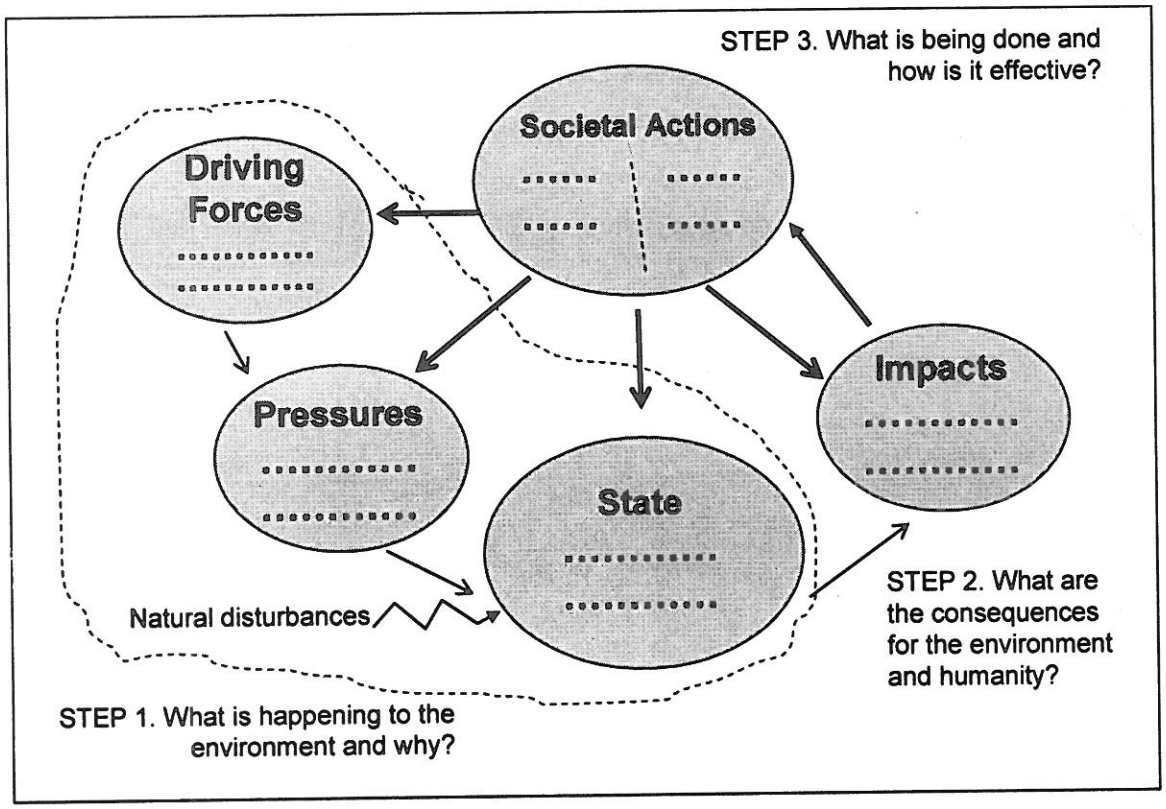
4.1 Integrated analysis of environmental trends and policies (DPSIR)

Country: _____ Year: _____

Driver	Pressure	State	Impact	Response

NB: Source/reference and credits of data to be clearly mentioned

4.2 Brief appraisal of national integrated assessment on marine environment (Indicators of DPSIR identified for the assessment)



NB: Source/reference and credits of data to be clearly mentioned

5.1 National capacity in terms of institutions, inter institution framework and programmes for sustainable development and environmental management

Country: _____ Year: _____

Type of National Framework/ mission project/ inter institutional arrangement, etc.	Details

NB: Source/reference and credits of data to be clearly mentioned

5.2 Archetypes of Vulnerability

Archetypes represent patterns of vulnerability where particular changes in the bio-physical and social domains compound to produce a pattern that repeats regionally. Looking for both situations that exemplify the archetype and also examples of opportunities/success stories where policy interventions have helped address vulnerability in the archetypes. Needed a short write-up on each of these (300 words), and examples are given as below:

Name	Description	Case Studies that exemplify the archetype	Opportunities//examples of success stories./examples of failures to deal with the vulnerability
Contaminated sites - Legacies of the past	Potentially harmful situations that are not eliminated and where especially the poorer sections of society are vulnerable to the negative consequences of this situation.		
Technological fixes of water problems	Vulnerability induced by the bad management or failure of centrally planned, large-scale projects (like dams) involving deliberate reshaping of the natural environment. Ambivalence: providing additional resources but having severe impacts on the environment and society.		
Urbanisation of the coastal fringe: balancing environmental risks and economic opportunities	Rapid coastal urbanisation in the context of increasing vulnerabilities to climate and weather-related hazards and climate change in coastal areas that are often ecologically sensitive.		
Vulnerability of Energy Production and Consumption systems in Industrialised countries: the next energy crises?	The ability (or lack thereof) of the energy production and consumption systems in industrialised countries to fulfil (increasing) energy demand in a changing context of security of energy supply, liberalisation and privatisation of the sector, impacts of climate change and requirements to contribute to mitigation.		

6.1 Emerging environmental issues related to coastal marine activities, e.g. chronic oil pollution, sprawling urbanization along the coast, degradation of major habitats, contamination, conservation and restoration of marshlands, radiological hazard, etc.

Describe some important new and emerging environmental issues that may, in your view, influence your country/ROPME Sea Area (RSA) in the future.

EMERGING ENVIRONMENTAL ISSUES*

For the purposes of this study, emerging environmental issues are defined as those issues (both positive and negative) which are not yet generally recognized but which will have significant influence on human and/or ecosystem health in the future.. They can have influence globally/Regionally/nationally and can include local issues that occur in many parts of the RSA. Emerging environmental issues are associated with one or more of the following situations:

1. ***One or more of political, social, economic, financial, institutional or technological developments that may cause changes in current trends of human activity which in turn may lead to significant environmental changes;***

2. ***New evidence or theory which suggests potential environmental changes, but which are currently either not widely accepted or are considered unproven. This would include new recognition of synergisms in human activity which produce significant environmental change;***

3. ***Lack of adequate policy, action or leadership on an existing issue which may become more significant or more urgent in the future.***

Examples of past "emerging environmental issues of RSA" are: Degradation of major wetlands or habitats; Pollution from river basins, coastal areas, offshore operations, and ships; Lack of harmonization of environment regulations; Lack of updated well-defined Regional Environmental Quality Objectives and Environmental Quality Standards (EQO/EQS) as a powerful tool to assess the environmental changes and trends for sound environmental management; Lack of continuity in regional monitoring programmes to fill the data gaps, improve the consistency, quality and reliability of data and information; Lack of political will in participation and follow-up of international conventions. For each of these issues, there was a period, sometimes as long as, or longer than, a decade, when a few researchers and others were aware of the potential significance of the issue for the environment, but most others, including key decision-makers, were not.

* Modified from UNEP-SCOPE Expert Consultation on Emerging Environmental Issues Questionnaire

I. ISSUE IDENTIFICATION

In this section we would like you to identify as many issues as you wish which fall within the definition of emerging issue at the beginning of this questionnaire. Questions 1-5 are provided to enable you to structure the issues that you have identified into the different situations indicated in the definition.

1. What emerging environmental issues may arise from the escalation or change in direction of current trends or activities, or may lead to new interactions?

_____

_____

_____

_____

2. What emerging environmental issues are now being recognized through research, new technology usage?

_____

_____

_____

_____

3. What environmental changes are already underway but whose significance for the future is generally not recognized or accepted, or is misunderstood?

_____

_____

_____

_____

4. What environmental issues are arising where actions to solve one problem may create another?

_____

_____

_____

_____

5. Are there any other potential emerging environmental issues that do not fit into any of the above categories that you can identify?

_____

_____

_____

_____

II. CHARACTERISTICS OF EMERGING ISSUE

Please provide the following information on the issue to which you believe the ROPME SOMER should give most attention, or the issue with which you are personally most familiar. If you wish to provide information on more than one emerging issue, please make additional copies of Sections II-IV, or use your own format.

Issue Name: _____

1. When do you think this issue will become a major or critical one?

- *in 0-5 years*
- *in 6-20 years*
- *after 20 years*

How do you expect the issue to develop over time?

_____
_____
_____
_____

2. What is, or will be, the scale of the issue?

- *global*
- *regional or continental*
- *sub-regional or national*
- *local but occurring in many parts of the RSA*

Additional information on scale:

_____
_____
_____
_____

3 This issue affects first and foremost:
Choose as many as appropriate:

- *whole country*
- *newly developed zones*
- *other (for example, particular population groups or specific ecological or geographic zones, or particular species: please give details below)*

Please expand on where the impacts are to be expected:

_____
_____
_____
_____

4. What are the main reasons which lead you to identify this as a significant emerging issue? (*Please identify and rank, if possible the most important reasons)*

- *rapidly developing issue*
- *a matter of urgency*
- *potentially highly beneficial*
- *potentially catastrophic*
- *no solution available or in sight*

- *irreversible consequences*
- *many potential interactions and ramifications*
- *large numbers of population involved*
- inter-sectorial conflicts

- *major impacts on human health expected*
- *major economic or financial impacts expected*
- *major ecological impacts expected*
- *major social, cultural or political impacts expected*

Please expand on your reasons:

_____

_____

_____

_____

The level of **controversy** surrounding this issue is:

- *very high*
- *high*
- *moderate*
- *low*
- *other response*: Please explain:

_____

_____

_____

_____

5. The level of **uncertainty** surrounding this issue is:

- *very high*
- *high*
- *moderate*
- *low*

If possible, please expand on what the uncertainty is related to (e.g. lack of basic understanding of processes involved, lack of research, unknown human or ecosystem response)

_____

_____

_____

_____

III. CONSEQUENCES AND CONTEXT OF EMERGING ISSUE

Please explain the causes and consequences of the emerging issue that you have identified, and any other relevant associations or interrelationships. Describe them in any appropriate form, such as a narrative or a schematic diagram. A worked example for oil pollution is provided.

Schematic Diagram for Oil Pollution as 'Chronically Emerging Environmental Issue'

Oil production	Oil transport	Oil refining	Ballast water discharge	Spilled oil cleaning

Driving forces/ Changes in material flows

Release of oil wastes and petroleum hydrocarbons into RSA

Increased concentration of hazardous hydrocarbons in the ecosystem of RSA

EMERGING ISSUE

Marine Environment Degradation in RSA

Consequences/ Impacts

Decrease of productivity and usage of marine environment

Fisheries Loss	**Health Hazards**	**Ecosystems Effects**	**Welfare Effects**
- Decrease of fish production - Decrease in fishing efficiency	- Carcinogenic - Tainted seafood	- Disruption of food chain - Introduction of alien species - Loss of biodiversity	- Decrease of desalination efficiency - Inconsumable sea food - Decrease of aesthetic value of beaches

Policy Responses

- ROPME Protocols
- MARPOL 73/78 Protocol
- Regional Reception Facilities
- National Research and Development

IV. ADDITIONAL INFORMATION ON EMERGING ISSUE

1. Please give references and additional documentation on this issue?
(Please attach information to this completed questionnaire)

2. What is the availability of data and basic data collection capacity on the emerging issue you have identified?

3. Please add any other information about the issue you are describing that you feel we should know.

8.1 Brief appraisal of ROPME protocols and programme (Updated information, if any)

Country: _____ Year: _____

Name of the Protocol(s)	Status

NB: Source/reference and credits of data to be clearly mentioned

8.2 Brief appraisal of relevant national legislation/ framework/ guidelines, environmental strategies, etc.

Country: _____ Year: _____

Environmental Strategies and Administration:

- Strategies for environmental protection and sustainable development:

Year of adoption	
National authority	
Name of the institution(s) and scope of work	

- National environmental protection policy:

Year of adoption	
National authority	

- National environmental conservation (Biodiversity) strategy::

Year of adoption	
National authority	
Name of the institution(s) and scope of work	

Contd...

Environmental Legislation:

- National environmental legislation and regulations:

Title	
Year of enactment	
Name of authority	
Provisions (e.g. preventive measures, punitive measures, liabilities and responsibilities, damage assessment and compensation claims,....)	

- Regional and international environmental agreements and arrangements:

Title of instrument	
Year of accession	
National authority	

- Effectiveness of environmental legislation:

Major achievements	
Principal needs	

- Action plans:

Details and scope	
Stakeholders and Responsibilities	

NB: Source/reference and credits of data to be clearly mentioned

8.3 Status of ratification of Kuwait Regional Convention and its Protocols by the Member States (Updated information, if any)

Country: _____ Year: _____

Name of the Protocol(s)	Status

NB: Source/reference and credits of data to be clearly mentioned

8.4 Status of ratification of ROPME Member States in international environmental agreements

Country: _____ Year: _____

Name of the agreement	Status of participation with details

NB: Source/reference and credits of data to be clearly mentioned

8.5 List or recommendations from various national and international framework processes at the Member State level

Country: _____ Year: _____

Type of Framework (High level meetings, agreements, etc.)	Recommendations

NB: Source/reference and credits of data to be clearly mentioned

8.6 List of recommendations from various Regional and international framework processes concerning the RSA

Country: _____ Year: _____

Type of Framework (High level meetings, agreements, etc.)	Recommendations

NB: Source/reference and credits of data to be clearly mentioned

Annex I

Integrated Analysis of Environmental Trends and Policies*

The GEO approach to integrated environmental assessment (IEA) addresses five key questions (Figure 1) as given below:

- Step 1: What is happening to the environment and why?
- Step 2: What are the consequences for the environment and humanity?
- Step 3: What is being done and how is it effective?
- Step 4: Where are we heading?
- Step 5: What actions could be taken for a more sustainable future?

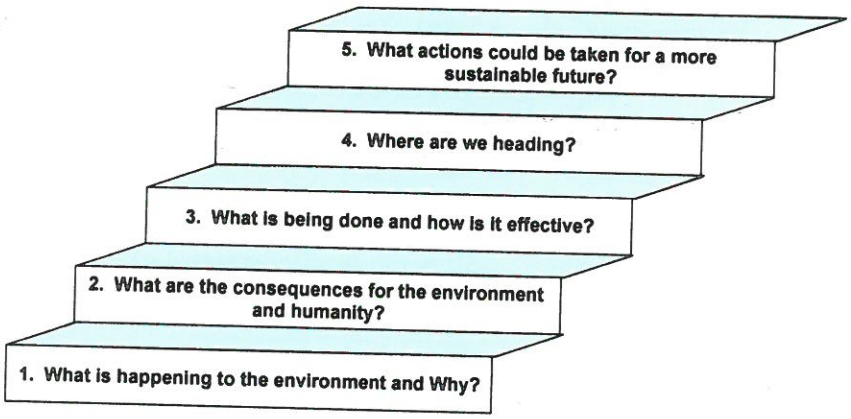


Figure (1): GEO Approach to Integrated Environmental Assessment and Reporting

A variant of the Driving Forces, Pressure, State, Impact, Response framework is adopted as the analytic framework in the draft GEO Resource Book for National-level IEA to help carry out an integrated analysis of environmental trends and policies. DPSIR used in this context suggests analysing and categorizing problems and inter-linkages, as shown in Figure 2. Arrows in the diagram indicate general cause and effect inter-linkages among components of the framework. While in some inter-linkages are straightforward and easy to prove, most often in environmental policy work the inter-linkages are complex and effects are typically attributable to multiple causes related to different actors and issues and operating on multiple spatial and temporal scales.

Step 1: What is Happening to the Environment and Why?

As illustrated on Figure 2, analyzing the STATE of the environment is a focal point for the integrated analysis. This involves identifying priority environmental state issues and identifying and analyzing their trends. In the context of global GEO reports, typical state variables fall under the categories such as air, land, water and biodiversity. To effectively answer the question of *What is Happening to the*

*Draft GEO Resource Book: National-Level Integrated Environmental Assessment and Reporting

Environment and Why, an analysis of state variables must be accompanied by an understanding and appreciation for the direct pressures and indirect natural and societal driving forces which affect environmental states, individually and collectively.

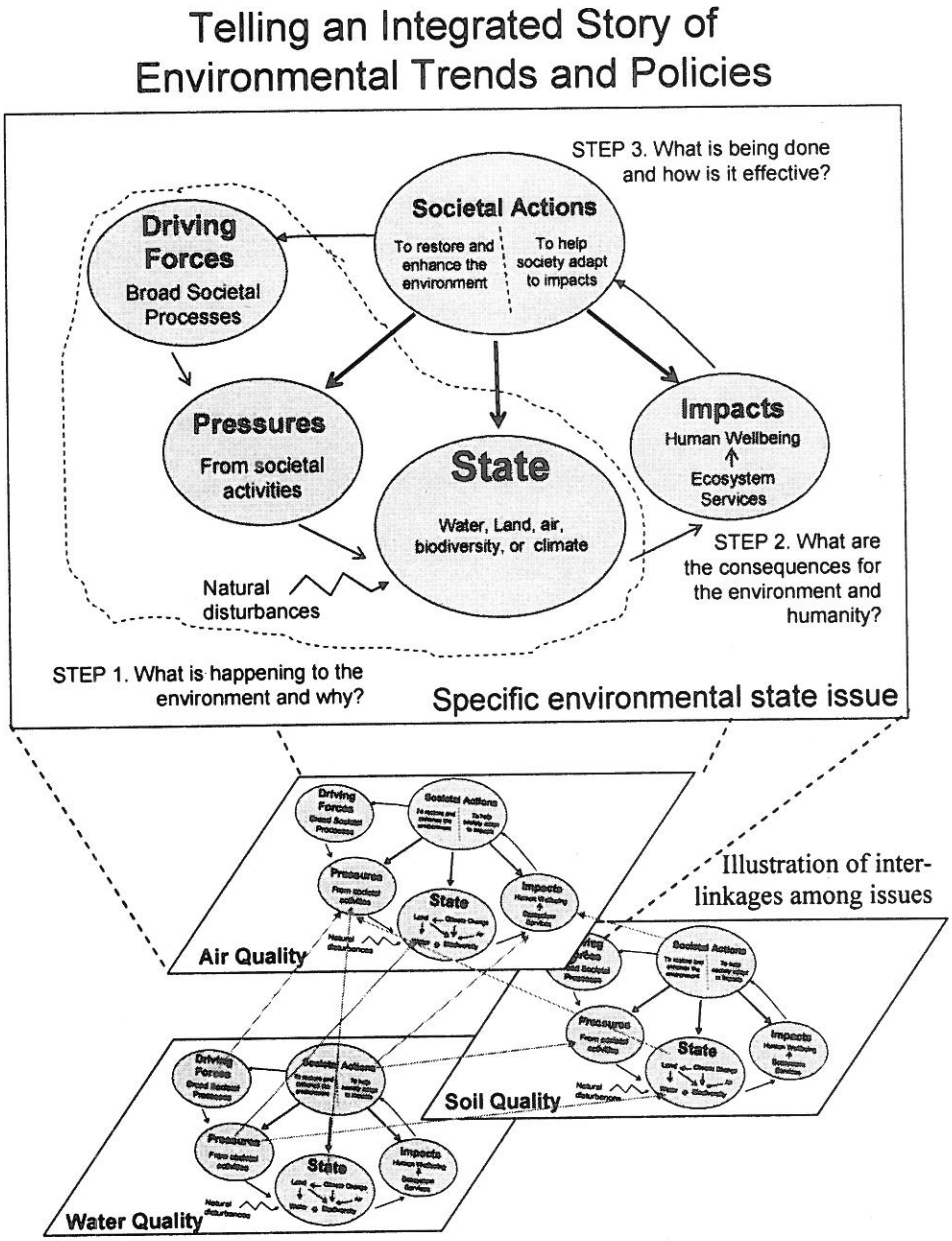


Figure (2): Analytic framework for the integrated analysis of environmental trends and policies

Step 2: What Are the Consequences for the Environment and Humanity?

The exposure to changes in various environmental states, combined with the ability of people to adapt to these changes determines the degree to which humans are vulnerable to environmental change. The impact of changes in the environment can be assessed in this light. More specifically, changes in the environment impact on

the various services that ecosystems provide to humans, and changes in these ecosystem services in turn, have an impact on human wellbeing.

Step 3: What is Being Done and How is it Effective?

Trends in the state of the environment are not only influenced by direct pressures and driving forces. They are also influenced by societal actions such as public policies in the form of economic instruments (e.g., taxes and subsidies), laws and regulations, expenditures (e.g., education and awareness), and various types of institutions. A mix of these policies can have effect on environmental trends directly, or indirectly through driving forces and pressures.

Analysis of these policies is often inexact and almost always wrought with scientific uncertainties. It is, however, an essential segment of a learning and adaptation cycle by bringing attention to the complex relationship between decision-making and environmental outcomes. Policy analysis is rarely exhaustive, and in most cases it cannot be prescriptive. It provides baseline information, points out major linkages between decisions and environmental outcomes, and provides a starting point for the consideration of more sustainable policy options.

Module 5 of the draft GEO Resource Book for National Level Integrated Environmental Assessment and Reporting presents a policy analysis approach which uses an understanding of what is happening to the environment and why (GEO Approach Step 1), and what are the impacts (GEO Approach Step 2) as the foundation. This approach is illustrated on Figure 3.

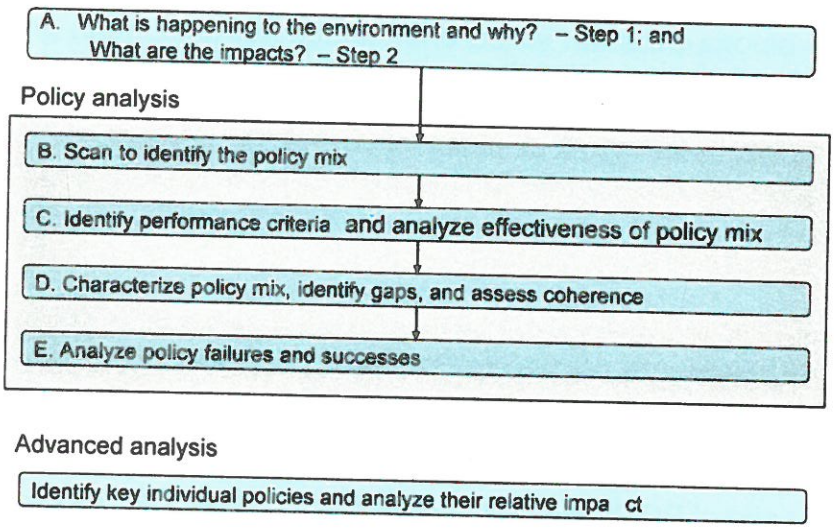


Figure (3): Policy Analysis Approach

Policy Analysis Step A: What is happening to the environment and why? And What are the consequences to the environment and humanity?

The starting point for any type of policy analysis is a thorough understanding the issue. This was the topic of sections 5 and 6 of this

- *Societal developments* such as changes in demographics, introduction of new technologies, wars, mass migrations, and others. All these are examples of societal pressures that can affect the state of the environment. Pressures can also be described and measured using indicators
- *Policies with unforeseen, unintended and negative consequences for the environment:* In the past three decades policies within a broad range of sectors have been developed, some of which have had negative consequences on the environment. These include a number of agricultural and corporate policies. Those identified as being pressures on the environment are likely to be more specific expressions of the societal developments mentioned above
- *Natural processes* such as storms, earthquakes, droughts and others that have a devastating effect on the environment. For example, droughts exacerbate problems of land degradation
- *Environmental policies* that exert positive pressure on environmental change (those that mitigate negative trends or help contribute to positive trends)

The **State** refers to the condition of the environment resulting from the pressures outlined above; for example, the level of air pollution, land degradation or deforestation. Trends are changes in the state of the environment over time. An understanding of environmental trends reveals whether the state of the environment is getting better or worse. It also gives an indication of how quickly any changes are happening (rate of change) and whether such rates are increasing or decreasing. Knowledge of both the state of the environment and its indirect effects is critical to decision makers and the public.

The **Impact** refers to the effect of the state or condition of the environmental issue under consideration on human health and well being, the economy, the ecosystems, as well as other environmental sectors. For example, increased land degradation may lead to one or a combination of the following: decreased food production, increased food imports, increased fertilizer use, malnutrition, clearance of more land, siltation of waterways, and so on. High nutrient levels in coastal waters (environmental state) can lead to increased occurrences of algal blooms, and increased shellfish poisoning in coastal communities (impact).

The **Response** component of the pressure-state-impact-response model corresponds to societal action taken collectively or individually to ease or prevent negative environmental impacts, correct environmental damage, or conserve natural resources. Responses may include regulatory action, environmental or research expenditures, public opinion and consumer preferences, changes in management strategies, and providing environmental information. There could similarly be a set of responses to positive changes in the environment. The successful conservation measures which change the status of a species as endangered could be an example of such a response. Satisfactory indicators or measurements of societal response tend to be the most difficult to develop and interpret.

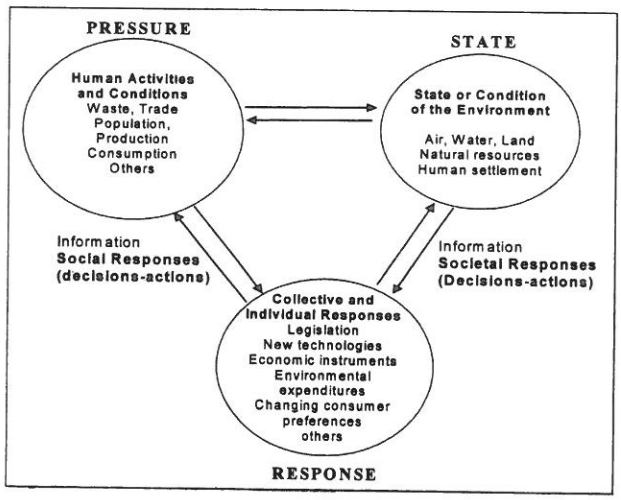
Simply put: Social and economic developments exert pressure on the environment, and, as a consequence, the state of the environment changes. These changes then have impacts on the social and economic functions of the environment, such as the provision of adequate conditions for health, resources availability and biodiversity. Finally these impacts may elicit a societal response that feeds back on the driving

forces (or on the state or impacts directly), through adaptation or curative rather than preventive action.

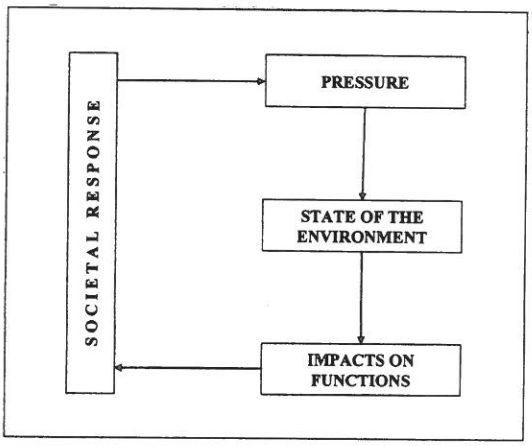
Identifying emerging environmental issues is the final component in the environmental reporting framework. In so doing, we are also trying to answer the following questions:

- What is happening now that might affect the environment in the long term?
- What are we doing to monitor the status and urgency of this issue?
- What are we neglecting that could turn this issue into a crisis?

As the world progresses, new environmental issues will continue to emerge. Detecting these issues early in time is important because then we can take action before they reach crisis levels.



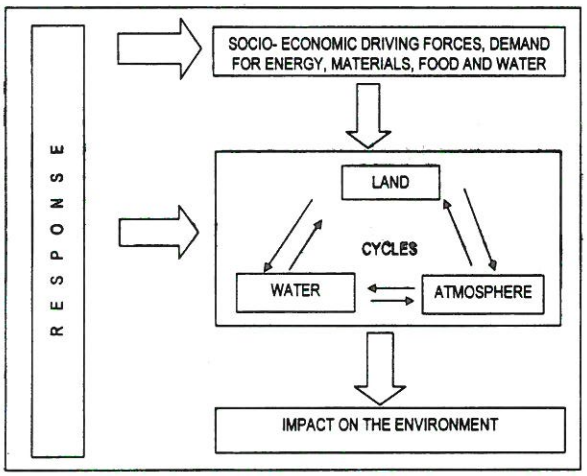
An example of the Pressure-State-Impact-Response framework
(Modified from Australia Department of the Environment, Sports and Territories, 1994 reported in Rump, 1996)



A simple representation of the Pressure-State-Impact-Response framework
(Source: Swart and Bakkes, 1995)

However, this task is made challenging by the following:

a) We sometimes tend to think about the state of the environment as a static entity at a moment in time. This is not correct. It is more realistic to think of the environment and global systems as a series of dynamic and interconnected processes changing and interacting over time. This is hard to imagine since time scales are often so large that change within an individual's lifetime is often not perceivable.
b) This is an area of uncertainty. We do not always work with hard facts, but often with controversial or insufficient evidence and testimony.
c) As with all attempts at forecasting, there are always surprises!



Basic elements of the Pressure-State-Impact-Response framework
(Source: Adapted from RIVM/UNEP (1997)

Annex III

GEO Data-Indicators Matrix[1]

THEME	ISSUE	POTENTIAL DATA VARIABLES	PROPOSED KEY (LEAD) INDICATORS	UNITS	CURRENT PRIMARY (LEAD) DATA SOURCES
1	2	3	4	5	6
LAND	Soil erosion	◆ Water erosion ◆ Wind erosion	◆ **Average annual soil erosion rate**	t/ha	◆ **UNEP/FAO/ISRIC: GLASOD**
	Desertification	◆ Area affected by desertification: rainfed croplands, irrigated land, forest and woodlands ◆ Livestock levels per km^2 in dryland area ◆ Population living below poverty line in dryland areas	◆ **Total land affected by desertification** ◆ Population living below poverty line in dryland areas	ha, % number, %	◆ **UNEP/FAO/ISRIC: GLASOD**
	Land salinization	◆ Areas affected by salinization and waterlogging	◆ Total area affected by salinization	ha, % p/y	◆ **UNEP/FAO/ ISRIC: GLASOD**
FORESTS	Forest loss, Forest resources management	◆ Forest management fractions (% protected) ◆ Forest change / domestication by sector (to agric, urban) ◆ Forest area change (open, closed, natural forests) ◆ Deforestation rate (open, closed, natural forests) ◆ Reforestation, natural and total, % success ◆ Production & trade of forestry products (wood, paper)	◆ Intensity of forest use (harvest / growth) ◆ Area of forest and woodland ◆ **Annual average change in forest area** ◆ Exports of forestry products ◆ Protected forest area ◆ Regeneration/afforestation area	% p/y total, per cap, % % % p/y ha, % p/y	◆ **FAO: FAOSTAT, FRA/SOFO**
	Degradation of forest quality	◆ Volume distribution by major tree species group within each biome (ha per each biome) ◆ Share of disturbed/deteriorated forests in total forest area	◆ Share of affected forests	% of total forest area	
BIODIVERSITY	Loss of species	◆ No. of species known (number) and threatened species (%) for vascular plants, mammals, birds, amphibians, reptiles, fresh water fishes	◆ Threatened plant species as % of total known plant species ◆ **Threatened animal species as % of total known animal species**	% %	◆ **IUCN/WCMC: Red List**

[1] As approved by the GEO Data Working Group in November 2004.

	Loss of habitat	◆ **Recorded wildlife habitat by ecosystem, for forests (dry, moist, all forest), wetlands, mangroves, grassland/savannah, deserts/scrubland**	◆ **Total areas of wetlands/marshes** ◆ **Total mangrove area** ◆ **Change in arable land area**	ha	◆ **IUCN/WCMC: Protected Areas Database** ◆ USGS/EDC: Olson World Ecosys. ◆ WWF: Ecoregions ◆ FAO: FAOSTAT
	Wildlife trade	◆ Trade in flora & fauna (birds, reptiles, plants, mammals, butterflies, ornamental fish)	◆ Net trade in wildlife and captive-bred species	million US$	◆ CITES Secretariat
	Overfishing	◆ Total inland, fresh water and marine fish catch, production, consumption and trade	◆ **Total & per cap marine fish catch** ◆ Total fish catch in inland waters (incl aquaculture)	t/year	◆ **FAO: FAOSTAT, FishStat, State of World Fisheries**
	Protected areas	◆ National, international and local parks & protected areas: biosphere reserves (terrestrial. and marine), wetlands of international importance, world heritage sites	◆ **Total protected areas (number, size) and % of total land area**	number, km^2, %	◆ **IUCN/WCMC: Protected Areas Database** ◆ UNESCO World Heritage List
FRESHWATER	Freshwater resources	◆ Annual internal renewable water resources ◆ Annual river flows from/to other countries, by basin ◆ Annual consumption by sector (domestic, industry, agric) ◆ Annual groundwater recharge ◆ Annual groundwater withdrawals by sector	◆ Annual internal renewable water resources per cap ◆ **Annual freshwater consumption per cap** ◆ Population with water stress	km^3, m^3/cap km^3, m^3/cap number, %	◆ **FAO: AquaStat** **WRI: World Resources Database** ◆ UNESCO: World Water Resources ◆ UNH/GRDC: Runoff Fields ◆ Univ. of Kassel: WaterGap ◆ IGRAC (Int Groundwater Resources Ass. Centre) GGIS
	Water quality	◆ River pH, concentrations of oxygen (DO, BOD), coliforms, particulates (TSS, TDS), nitrates (NO_3, NH_4, NP), phosphor (PO_4), metals (HMs), pesticides ◆ Fish biodiversity (reserves, specie no.) ◆ Ground water pH, concentrations of nitrates, TDS (salinity), iron, chlorides, sulphates ◆ Waste water treatment: % served, public expenditures	◆ **BOD level of most important rivers** ◆ Nitrate level of most important rivers ◆ Coliform count per 100 ml ◆ Pesticide concentrations in most important rivers	mg/l mg/l no./100 ml µg/l	◆ **GEMS/Water: Atlas of Global Water Quality, others** ◆ WRI: World Resource Database
ATMOSPHERE	Climate change	◆ Anthropogenic emission of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, total and by sector ◆ Annual mean temperature, precipitation ◆ Fossil fuel supply (% and intensity)	◆ **Annual CO_2 emissions per cap and per unit of economic output** ◆ Global mean temperature ◆ Global mean concentration of CO_2 ◆ Fossil fuel consumption share ◆ Renewables consumption share	t/cap, t/1,000 US$ °C ppm % %	◆ CDIAC: Trends On-line ◆ **UNFCCC: National Communications** ◆ IEA: Energy Statistics and Balances ◆ IPCC/CRU: Meam Monthly Climatologies ◆ WMO: Climate Anomalies

	Air pollution	◆ Emissions of precursors (NO_X, CO, NMVOC, CH_4), total and by sector ◆ Emissions of acidifying gases (NH_3, NO_X, SO_2), total and by sector ◆ Atmospheric concentration of CO, SO_2, NO_X, NH_3, PM, Pb, VOC, O_3 ◆ Rain water pH in selected areas ◆ Expenditures on air pollution abatement and control	◆ **NO_X, SO_2 emissions per cap and per unit of economic output**	t/cap, t/1,000 US$	◆ IGBP/GEIA/RIVM: EDGAR Database
	Stratospheric ozone depletion	◆ Production, consumption, import & export of ODS ◆ Atmospheric ODS concentration over selected cities (parts per trillion) ◆ Ozone levels/total ozone column over selected cities (Dobson units) ◆ Ground level UV-B radiation over selected cities	◆ Total ODS consumption by compound ◆ **Total ODS consumption per capita**	tonne of ozone depleting potential kg/cap	◆ **UNEP Ozone Secretariat** ◆ World Ozone & Ultrav. Rad. Data Centre ◆ AFEAS Production, Sales and Emissions
COASTAL AND MARINE AREAS	Coastal & marine pollution	◆ Average annual sediment load ◆ Average annual untreated waste disposal by sector ◆ Discharge of oil into coastal waters ◆ Concentrations of HMs (Hg, Pb, Cd, Cu, Fe, Mn, Ni, Co) ◆ Concentration of PCBs ◆ Industrial activities in coastal region ◆ Share of pollution caused by sector ◆ Coastal population (growth, urban share) ◆ Tourist arrival in coastal/marine areas ◆ Number of hotels/resorts in coastal areas	◆ Average annual sediment load ◆ Average annual untreated waste disposal by sector ◆ **% of urban population living in coastal areas** ◆ Area of Exclusive Economic Zone (EEZ)	t t % %, km^2	◆ UNEP Regional Seas Programme and Global Programme of Action (GPA) ◆ WCMC: Protected Areas Database ◆ IMO: Global Waste Survey ◆ **UNSTAT: UN Common Database** ◆ ICLARM: ReefBase, FishBase ◆ WRI: Reefs at Risk ◆ G3OS (GOOS, GTOS, GCOS)
DISASTERS	Natural disasters	◆ Occurrences, financial damage and casualties (people affected, homeless, injured, killed) related to floods, droughts, cyclones, earthquakes, landslides, volcanic eruptions, forest fires	◆ **Total number of natural disasters p/y** ◆ Total number of people killed & affected by natural disasters ◆ Economic loss due to natural disasters	number number million US$	◆ **OFDA/CRED: EM-DAT** ◆ Munich Re: Annual review of nat. dis. ◆ UN-OCHA: ReliefWeb ◆ UN-ISDR
	Human-induced disasters	◆ Occurrences, financial damage and casualties (people affected, homeless, injured, killed) related to transport and industrial accidents	◆ **Total number of technological. accidents p/y** ◆ Total number of people killed & affected by technological accidents ◆ Economic loss due to techn. accidents	number number million US$	◆ **OFDA/CRED: EM-DAT** ◆ UN-ISDR
URBAN AREAS	Urbananization	◆ Urban population, total, growth rate, ◆ Number of cities with over 750,000 population	◆ Average annual urban population growth rate	%	◆ **UNPD: World Urbanization Prospects**

	Waste management	◆ Waste generation and disposal methods by sector: municipal, industrial, agricultural, hazardous	◆ **Municipal waste production per cap** ◆ Industrial waste generated per unit of economic output ◆ Hazardous waste production per unit of economic output ◆ Waste management fractions ◆ Exposure to HMs, toxic chemicals ◆ Share of recycled waste	kg/capita kg/1,000 US$ kg/1,000 US$ %	◆ OECD: Data Compendium ◆ UNSTAT: UN Common Database ◆ WRI: World Resources Database ◆ UNEP Chemicals, Basel Conv. Secr.
SOCIO-ECONOMIC (INCL. HEALTH)	Population and social	◆ Population, total and growth rate ◆ Total fertility rate ◆ Adult literacy (%) by sex ◆ Education enrollment, net and gross (primary, secondary, tertiary), by sex ◆ Education expenditures (prim., sec., tert.) ◆ Labour force total (% population), by sector (agric., ind., serv.) and by sex ◆ Telephones (main lines and cellular per 100 people) ◆ Daily newspapers (copies per 100 people) ◆ Radios (number per 100 people) ◆ Televisions (number per 100 people) ◆ Computers (number per 100 people) ◆ Internet connections (number per 10,000 people)	◆ Average annual population growth rate ◆ Population density	% inh/km^2	◆ **UNPD: World Population Prospects** ◆ UNESCO: World Education Statistics ◆ **UNDP: Human Development Indicators** ◆ UNSTAT: UN Common Database ◆ ILO: Laborsta Database, KILM indicators ◆ **World Bank: World Development Indicators**
	Economy	◆ Real GDP, total and per cap ◆ Power Purchasing Parity (PPP) ◆ Number of people in absolute poverty, rural and urban ◆ Merchandise exports (value), total and by sector: manufactures, fuels/minerals/metals, services ◆ Merchandise imports (value), total, food, fuels ◆ Trade (% of GDP) ◆ Terms of trade (1995=100) ◆ Inflation, consumer prices (annual %) ◆ Unemployment rate (%) ◆ Total external debt total and % of GNP ◆ Total debt service (as % of exports of goods and services) ◆ Foreign direct investment, net inflows (% of GDP) ◆ Official Development Assistance & Aid (ODA)	◆ GDP per capita ◆ PPP per cap ◆ Value added as % of GDP by sector	const 1995 US$ intern. US$ %	◆ **World Bank: World Development Indicators** ◆ Univ. of Purdue: GTAP ◆ UNCTADWTO(ITC): COMTRADE ◆ UNSTAT: UN Common Database

	Consumption and production	♦ Total commercial energy production, by sector: fossil fuels, hydro, nuclear, geothermal, biomass, solar, wind ♦ Total commercial energy use, total and per cap ♦ Traditional fuel use (% of total energy consumption) ♦ Energy imports, net (% of energy consumption) ♦ Renewable energy use (%) ♦ Total electricity generation by sector: thermal, hydro, nuclear, non-hydro renewables ♦ Total electricity consumption ♦ % population with access to electricity ♦ Value added by sector: agric., ind., manuf., services ♦ Distribution of GDP by demand sector: government consumption, private consumption, gross deomestic investment, gross domestic saving ♦ Defense expenditures (% of GDP)	♦ Total commercial energy production ♦ **Commercial energy consumption per capita**	tonne of oil equivalent	♦ **IEA: Energy Statistics and Balances** ♦ World Bank: World Development Indicators
	Transport	♦ Motor vehicles in use (per 1,000 people), by type of engine ♦ Total length of motor ways ♦ Density of motor ways (km/10,000 km^2) ♦ Road traffic intensity per unit of GDP ♦ Number of departures and arrivals (airports) ♦ Energy consumption by road transport (% share of total consumption)	♦ Road traffic intensity per unit of GDP	vehicle-km/1,000 US$	♦ World Bank: World Development Indicators ♦ **UNSTAT: UN Common Database**
	Agriculture and livestock	♦ Agricultural production index ♦ Food production index ♦ Pesticide consumption ♦ Fertilizer use ♦ Livestock units	♦ Use of nitrogen fertilizers on agric. land ♦ Use of phosphate fertilizers on agric. land ♦ **Use of pesticides on agric. land** ♦ Agricultural production value added	t N/ha t P_2O_5/ha active kg/ha % of GDP	♦ **FAO: FAOSTAT** ♦ IFA: Fertilizers & their use

	Human health and well-being	◆ Population below poverty line, urban and rural, by sex ◆ % population with access to safe drinking water, urban and rural ◆ % population with access to sanitation services, urban and rural ◆ No. of people per physician, per hospital bed ◆ No. of people with access to health services ◆ Government expenditures on health services ◆ Calories supply, total and from animal food ◆ Available calories as % of requirement ◆ Malnutrition in children under five years ◆ Average life expectancy, and by sex ◆ Crude death rate ◆ Infant mortality rate ◆ Mortality incidence, by disease (malaria, respiratory infections, AIDS etc) ◆ Burden of disease (DALYs) ◆ Percent of population affected by noise ◆ Percent of human population in noise prone areas ◆ Level of noise in urbanized cities	◆ **% of total population with access to safe drinking water** ◆ **% of total population access to sanitation services** ◆ No. of people per physician ◆ Infant mortality rate (per 1,000 births) ◆ Caloric intake per cap ◆ % of GDP spent for health services ◆ Mortality caused by respiratory infections ◆ Mortality caused by communicable diseases ◆ Disability-Adjusted Life Years (DALYs)	% % number number cal/day/pp % no. per 1,000 no. per 1,000 year	◆ UNPD: World Population Prospects ◆ WHO: WHOSIS, World Health Report, Global Burrden of Disease ◆ UNICEF: Childinfo.org ◆ **WHO/UNICEF Joint Monitoring Program (JMP)**
	Governance	◆ Environmental institutions, policies in place ◆ Environmental conventions signed ◆ No. of conflicts, state failures	◆ **Signatories to major environmental conventions**		◆ **UNEP/IUCN/FAO Ecolex** ◆ CIESIN: ENTRI ◆ CIDCM SFTF Database ◆ Worlbank Governance indicators ◆ Transparancy International: Corruption Index
GEOGRAPHY	Support data sets	◆ Admin boundaries (incl EEZ) ◆ Infrastructure (roads, rivers, lakes) ◆ Watershed boundaries ◆ Cities (location, area) ◆ Population density (time series) ◆ Landcover & vegetation (time series) ◆ Soil units and characteristics ◆ Elevation & slopes			◆ **ESRI:ArcWorld, ArcAtlas** ◆ **WHO: UN EIP admin boundaries** ◆ **CIESIN: GPW** ◆ **WRI: River basins** ◆ **UNH/GRDC: Run-off Fields** ◆ **GEMS-Water: Atlas of Global Water Quality** ◆ **USGS/EDC: GLCC, HYDRO1k** ◆ **FAO: Soil Map of the World** ◆ **UN-Habitat: Urban Observatory**

REGIONAL ORGANIZATION FOR THE
PROTECTION OF THE MARINE ENVIRONMENT (ROPME)
P.O. Box: 26388, Safat, Kuwait Tel: +965 5312140 Fax: +965 5324172
E-mail: ropme@qualitynet.net www.ropme.org