

IAEA – UNEP collaboration to improve data quality in marine pollution monitoring programmes of Regional Seas

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**UNEP Workshop on selecting indicators for the state of Regional Seas
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UNEP Regional Seas – IAEA Marine Environment Laboratories: a long history of collaboration



1974 UNEP creates the Regional Seas Programme and requests the IAEA (International Laboratory of Marine Radioactivity of Monaco) to conduct the first regional Interlaboratory Comparison exercise (ILC) on trace elements

1986 IAEA sets the Marine Environmental Studies Laboratory (MESL), to manage the non-nuclear programmes, particularly those pertaining to UNEP's Regional Seas Programmes.



MESL acts as a specialised coordinating centre for the Regional Seas Programmes and the Regional Analytical Centre for UNEP/MAP - MED POL to strengthen data quality assurance in the analytical laboratories participating to the **MED POL** monitoring programme



Towards an Ecosystem Approach in UNEP Regional Seas

- **Regional Sea Conventions progressively apply an Ecosystem Approach to the management of human activities that may affect the Regional marine and coastal environment**

Steps

1. Definition of an ecological Vision for the Regional Sea
2. Setting of common Regional strategic goals
3. Identification of important ecosystem properties and assessment of ecological status and pressures
4. Development of a set of ecological objectives corresponding to the Vision and strategic goals
5. Derivation of operational objectives with indicators and target levels
6. **Establish monitoring programmes for ongoing assessment and regular updating of targets**
7. Development and review of relevant action plans and programmes



Ecological Objective 9: Contaminants cause no significant impact on coastal and marine ecosystems and human health (i)

Operational Objectives	Indicators	Data needed
<p>9.1 Concentration of priority contaminants is kept within acceptable limits and does not increase</p>	<p>9.1.1 Concentration of key harmful contaminants in biota, sediment or water</p>	<p>Marine organisms and sediment</p> <p>Cd, Hg, Pb, PAHs, PCBs, Pesticides and other POPs</p>



Ecological Objective 9: Contaminants cause no significant impact on coastal and marine ecosystems and human health (ii)

Operational Objectives	Indicators	Data needed
<p>9.3 Acute pollution events are prevented and their impacts are minimized</p>	<p>9.3.1 Occurrence, origin (where possible), extent of significant acute pollution events (e.g. slicks from oil, oil products and hazardous substances) and their impact on biota affected by this pollution</p>	<p>Oil slicks occurrence (events – amount of oil)</p> <p>Concentration of petroleum hydrocarbons in seawater</p> <p>Fingerprinting oil source using biomarkers and stable carbon isotopes</p>



To assess marine pollution, Regional Sea Conventions have to establish and implement quality assured marine pollution monitoring programmes



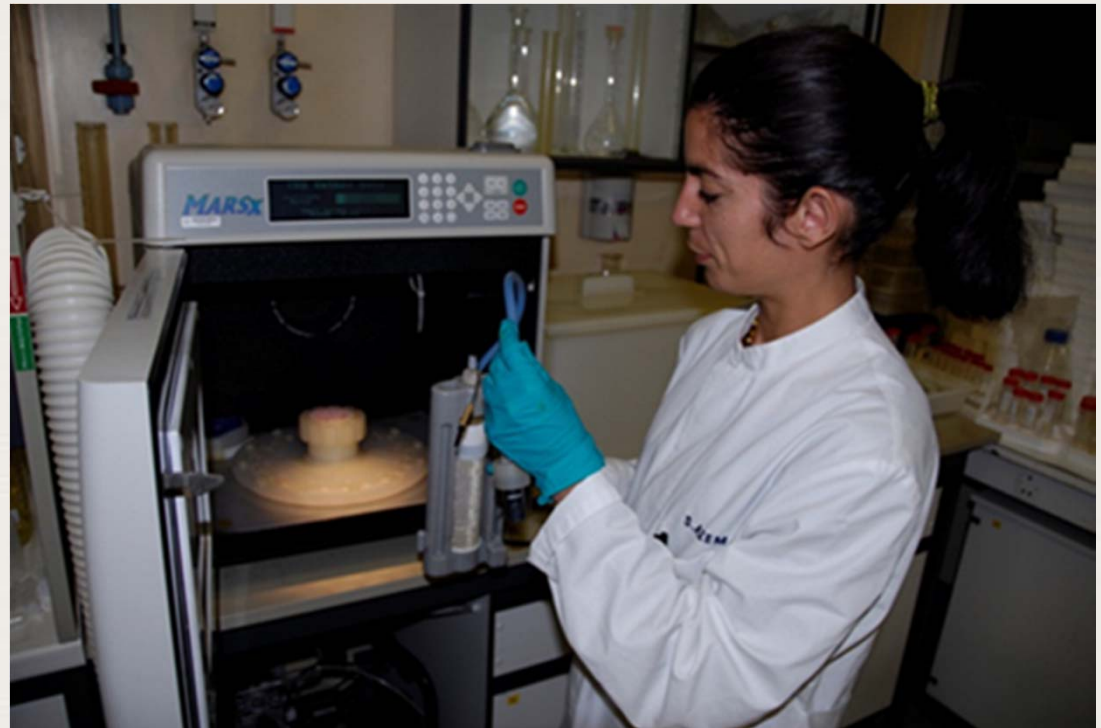
Quality assured data is needed to

- Assess the state and trends of pollution
- Evaluate impact on the marine ecosystem
- Support decisions on the establishment of actions plans, programmes, and measures to control pollution
- Assess the effectiveness of the measures taken



IAEA assists Member States in Regional Seas to strengthen data Quality Assurance in marine pollution monitoring programmes

- **Production and distribution of Reference Materials**
- **Development of Reference Methods for analysis of pollutants and radionuclides**
- **Interlaboratory Comparison Exercises and Proficiency Tests**
- **Capacity building through training**



IAEA EL produces Reference Materials for trace elements, organic contaminants and radionuclides in marine matrices (seawater, sediment and biota)

RMs are vital for training programmes, inter-comparison studies and for regional laboratories to maintain their own AQC procedures

IAEA EL can provide RMs to laboratories participating in Regional Seas Programmes

17 RMs available for trace elements and organic contaminants in marine sediment & biota



IAEA 405	RM	Marine sediment	Trace Elements + Methyl Hg
IAEA 406	RM	Fish	Organic Compounds
IAEA 407	RM	Fish	TE + MeHg
IAEA 408	RM	Marine sediment	OC
IAEA 417	RM	Marine sediment	OC
IAEA 432	RM	Mussel	OC
IAEA 435	RM	Tuna	OC
IAEA 436	RM	Tuna	TE + MeHg
IAEA 158	RM	Marine sediment	TE + MeHg
IAEA 159	RM	Marine sediment	OC
IAEA 451	CRM	Clam	OC
IAEA 452	CRM	Scallop	TE + MeHg
IAEA 457	CRM	Marine sediment	TE
IAEA 456	CRM	Marine sediment	TE + MeHg
IAEA 461	CRM	Clam	TE + MeHg
IAEA 458	CRM	Marine sediment	TE + MeHg
IAEA 459	CRM	Marine sediment	OC



IAEA organises Interlaboratory Comparison Exercises (ILC) and Proficiency Tests (PTs) for Regional Seas laboratories

- To demonstrate competence
- To establish degree of equivalence between results of the participating laboratories
- To test analytical methods
- To be used as a training exercise to improve skills



HISTORY

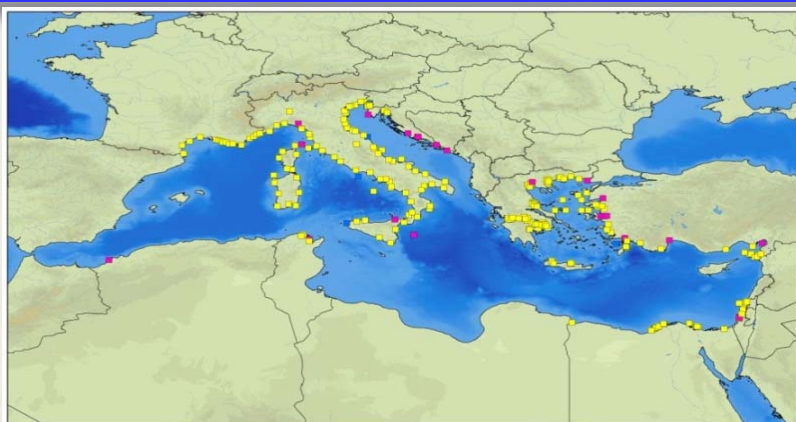
30 world-wide ILCs and 21 Regional Seas Proficiency Tests have been organised by IAEA Environment Laboratories from 1974 to 2013 on the analysis of trace metals and organic contaminants in marine biota and sediment.

- Participation of hundreds of laboratories around the world
- Establishment of a wide network of laboratories participating in ILCs and Certified Reference Materials characterisation exercises



Proficiency Tests assess the performance of Regional Seas laboratories and help them improve data quality

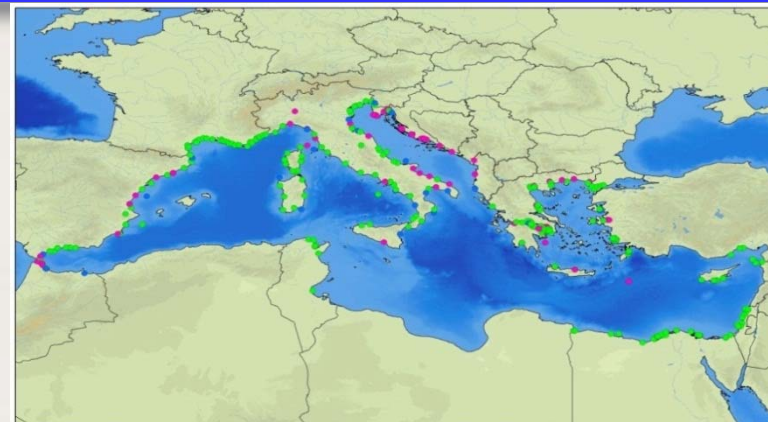
Case study: UNEP/MAP



MEDPOL III and IV monitoring Stations

Sediments

Trace Metals (Hg, Cd, Pb), Chlorinated Hydrocarbons (Pesticides, PCBs), PAHs

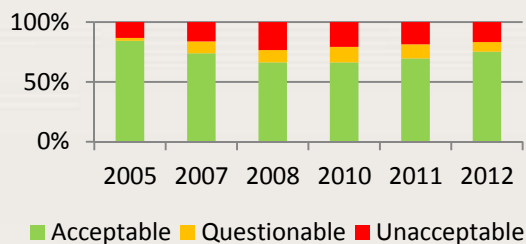


MEDPOL III and IV monitoring Stations

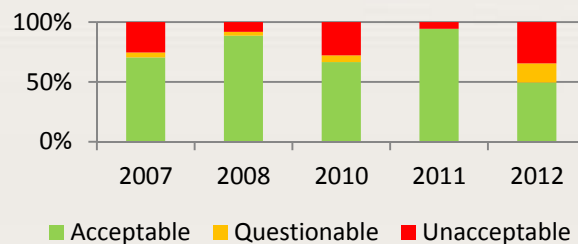
Biota (*Mytilus galloprovincialis*, *Mullus barbatus*)

Trace Metals (Hg, Cd, Pb), Chlorinated Hydrocarbons (Pesticides, PCBs)

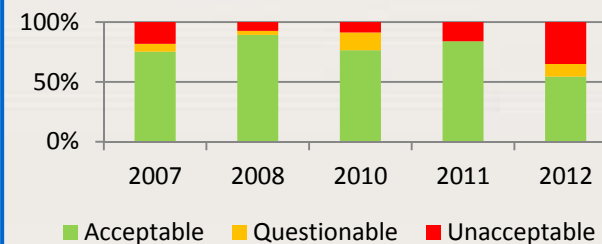
Trace Elements



PCB congeners



Petroleum Hydrocarbons



IAEA Environmental Laboratories organise Training Courses for Regional Seas Convention scientists: Lectures and practical laboratory work

- Sampling water, biota, sediment
- Pre-treatment and sample preparation
- Application of analytical methods
- Optimization of the instruments
- Quality assurance and quality control
- Use of Reference Materials
- Calculations of the contaminant concentrations



UNEP Regional Seas training courses history

UNEP/MAP-MED POL and ROPME



1986 – 2013 MED POL Programme

- **52 training courses on trace elements and organic contaminants**
- **~ 300 scientists**
- **17 Mediterranean countries**



2007-2008 ROPME Training Courses

- **5 training courses on Petroleum Hydrocarbons, chlorinated hydrocarbons and Sterols**
- **75 scientists**
- **Bahrain, Iran, Kuwait, Oman, Saudi Arabia**



IAEA develops analytical fit-for-purpose analytical methods for monitoring pollutants of concern in Regional Seas

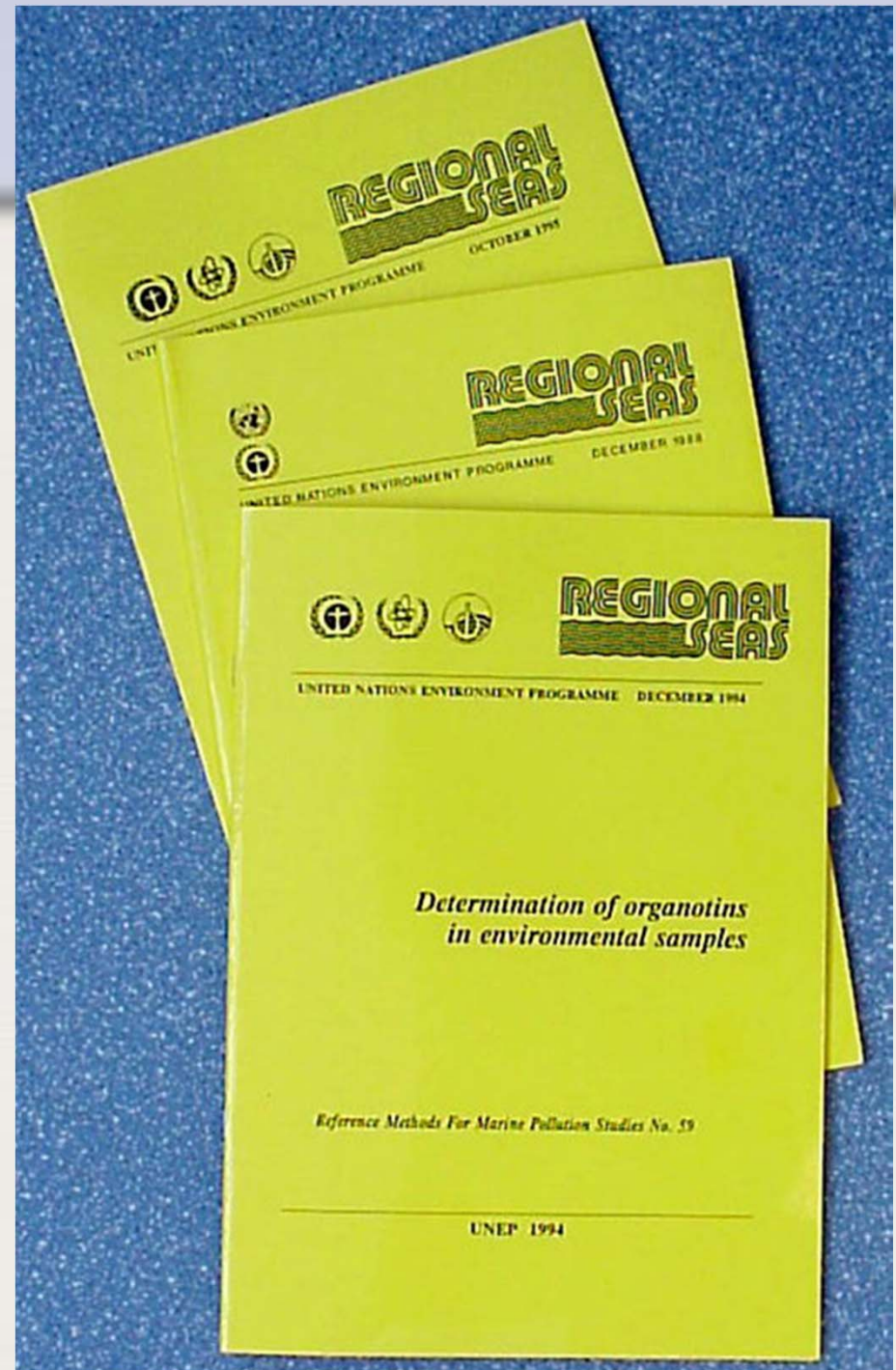
63 Reference (Recommended) Methods for the analysis of chemical contaminants in organisms, sea water and sediments for marine pollution programmes have been developed by UNEP – IAEA – IOC

www.unepmap.org
(documents and publications)

Additional methods for pollutants of concern under development (MeHg)

Methods for the analysis of radionuclides in marine samples

Methods for the analysis of stable isotopes to assess pollution and climate change processes in the marine environment and to identify pollution sources



International Atomic Energy Agency
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CONCLUSIONS

Regional Seas Member States need data for marine pollution indicators

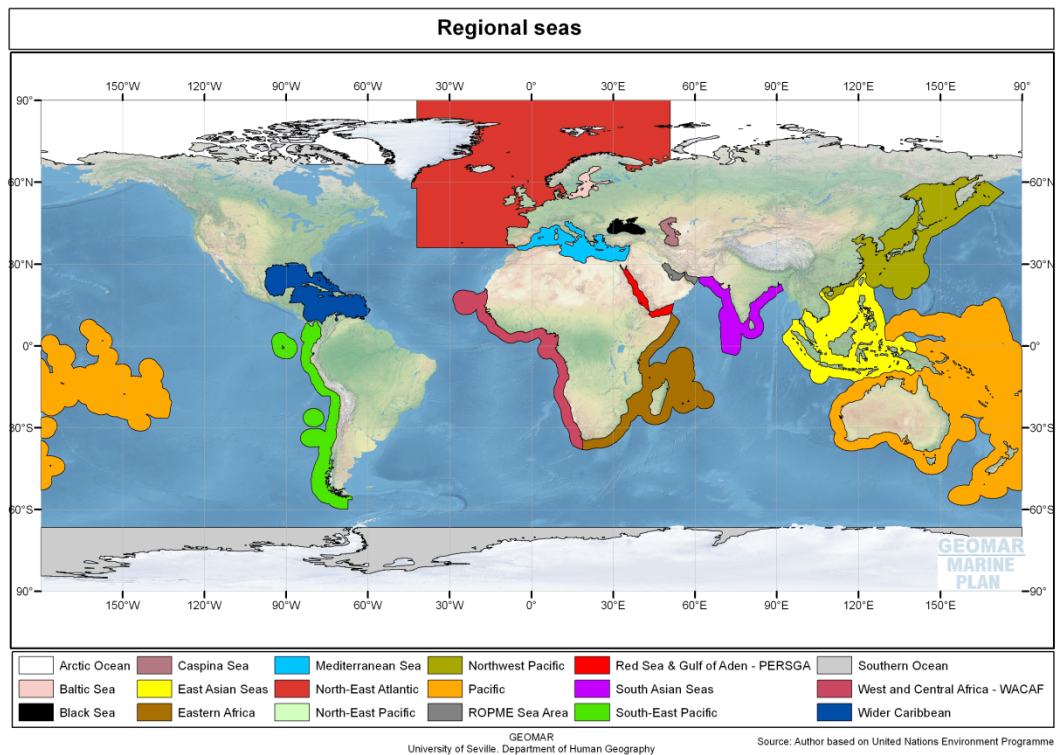
- Analytical measurements should be made to satisfy a defined ecological objective
- Analytical measurements should be made using methods and equipment which have been tested to ensure they are fit for purpose
- Staff making analytical measurements should be both qualified and competent to undertake the task
- There should be a regular independent assessment of the technical performance of a laboratory
- Analytical measurements made in one location should be consistent with those made elsewhere
- Organisations making analytical measurements should have well defined quality assurance and quality control procedures

IAEA assistance

- Development of marine pollution monitoring programme
- Recommended Analytical Methods, ILCs, Proficiency Tests, purchase of equipment
- Training courses
- Proficiency Tests, ILCs
- Proficiency Tests, ILCs
- Capacity building on Quality Assurance/Quality Control in laboratories with QA/QC problems



Looking forward to continuing and strengthening our fruitful cooperation for the benefit of Member States



Thank you!



**International Atomic Energy Agency
Dept. of Nuclear Sciences and Applications**

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