# A BLACK SEA INTEGRATED ENVIRONMENTAL QUALITY MONITORING – A PREREQUISITE FOR REGIONAL CO-OPERATION AND EU ACCESSION

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**Abstract.** Due to the present seriously degraded Black Sea ecosystem the necessity and opportunity of updated national marine monitoring programmes, e.g. in Romania, are emphasized. Such programmes should match contemporary exigencies and be harmonized at regional level based on previously gained positive expertise and experience such as, GEF/Black Sea Environmental Programme, EU/PHARE Chemical Monitoring Programme, EU/ECOS OUVERTURE-QUALIPOL. Results aim to serve national central and local authorities and international organizations in adequate decision making with respect to marine environmental management and protection according to sustainable development needs.

**Key words:** Black Sea, ecosystem disturbance, ecological crises, eutrophication, pollution / water quality monitoring

**Moto**: "*The problems of the Black Sea are not so different as elsewhere, but they are more obvious, in part of isolated, contained nature of the Black Sea*"
Dr. Jane Lubchenko, 1998

## INTRODUCTION

In A. Pardo's revolutionary concept of the Common Heritage of Mankind, the third dimension was **environmental:** "The Common Heritage had to be conserved to be shared with future generations, which are also a part of Mankind" (Mann Borgese, 2000).

During the past four decades considerable progress has been made towards the understanding of the complex interactions of the marine environment and the need for integrated management and sustainable development.

Important steps in achieving the above need developed at international, regional and national level, as follows:

- UNCLOS process / the Law of the Sea Convention and Agenda 21,
- UN Framework Convention on Climate Change,
- Convention on Biological Diversity,
- FAO Code of Conduct for Responsible Fisheries,
- Straddling Stocks Agreement,
- Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities,
- Integrated Maritime Enforcement,
- National Integrated Maritime Enforcement.

Still, according to most recent assessments, "the state of health of the marine environment is declining, and so are in parallel the conditions of the marine resources, the situation of coastal communities, perhaps particularly in developing countries, and associated economies depending primarily upon marine related activities and resources" (Kullenberg, 1999). The adoption of UNCLOS has projected the comprehensive perspectives of the Ocean. The UNCED in Rio de Janeiro 1992 has stimulated the process of integrating the environment, *y compris* the marine one, into the sustainable development.

Major concerns regarding the marine environment nowadays refer to climate change, global warming and related sea level rise, coastal erosion, pollution, decline of biodiversity and living resources.

Marine pollution through the atmosphere and from land-based sources (mainly vast drainage areas of rivers and streams) consists in increased inputs of sediments, heavy metals, nutrients, radionuclides, persistent organic substances, petroleum hydrocarbons, litter, sewage. Direct consequences on the ecosystem relate to environmental degradation due to eutrophication, hypo- and/or anoxya, continuous loss of plant and animal species. Particularly sensitive is the coastal zone, wherefrom about 90% of marine living resources are being collected.

A particular consideration with respect to environment protection deserve marine protected areas and adequate management of marine life and products.

## GENERAL CONSIDERATIONS ON THE BLACK SEA

The Black Sea is the largest, low tide, brackish-water intercontinental sea. It has been exposed to natural and environmental fluctuations and more recently to strong anthropogenic stresses. Now it is facing a huge **ecologi-**

**cal disequilibrium** which could finally turn this body of water into a dead sea (Bologa, 2003).

Contemporary experts already consider that "the state of the Black Sea environment continues to be a matter of concern due to the ongoing degradation of its ecosystem and the sustainable use of its natural resources" (Strategic Action Plan for the Rehabilitation and Protection of the Black Sea, 1996).

Offering food and sustaining commerce and recreation for centuries, the Black Sea is severely threatened today by ecological degradation, including **pollution**, from activities within the region as well as its vast catchment area. Therefore "this sea is especially vulnerable because – of all inland seas – it is perhaps the most isolated, the least able to dilute or eliminate toxins once introduced" (Earle, 1997). Above stressed pollution considerably concern **chemical, oil** and **bacterial** pollution, as well as **biological** pollution through accidental introduction of (harmful) exotic species (Zaitsev, 1997).

The generally accepted ecological term of reference to the significant transformations in the Black Sea is the period 1950-1960.

Due to the present situation, the Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention) was signed by all coastal states: Bulgaria, Georgia, Romania, Russian Federation, the Ukraine and Turkey in 1992. It was followed by the Odessa Declaration (1993), the Strategic Action Plan for the Rehabilitation and Protection of the Black Sea (Istanbul, 1996), and the Ministerial Declaration (Monaco, 1998). An International Convention for the Protection of the Danube River was also signed by the thirteen Danube riparian countries in 1994.

The Black Sea and Danube conventions were assisted by Global Environment Facility (GEF) projects, whose main tasks consisted in (Mihnea, 2000):

- to increase the countries capacity of **monitoring** the specific ecosystems and to assess the effects of pollution;
- to identify and assess the main land based (point and non-point) pollution sources;
- to develop Transboundary Diagnostic Analyses;
- to develop and approve Strategic Action Plans (Black Sea and Danube);
- to identify and develop investment portfolios.

Among the first results were the compilation of an inventory and assessment of land based pollution sources, the publication of *Black Sea Transboundary Diagnostic Analysis* (1997) as a scientific explanation of the root causes of environmental degradation of the Black Sea, and of *Black Sea Pollution Assessment* (Mee and Topping, 1998).

In 1997 a Joint Technical Working group was established by the Black Sea and Danube Commissions (Mihnea, 2000). Its task was to identify the existing correlation between the increase in the nutrient load in the Danube and correspondingly in the Black Sea, and the response in the ecosystem. The main conclusions were:

- "The **long-term objective** is for all Black Sea basin countries to take measures to reduce nutrient levels and other hazardous substances to such levels necessary to permit Black Sea ecosystems to recover to similar conditions as those observed in the 1960s";
- "As an **intermediate objective**, urgent control measures should be taken by all countries in the Black Sea basin, in order to avoid that discharges of nitrogen and phosphorus to the Black Sea exceed those levels observed in 1997. This will require countries to adopt and declare strategies that permit economic development whilst ensuring appropriate practices and measures to limit nutrient discharge, and to rehabilitate ecosystems which assimilate nitrogen and phosphorus. This target, monitored and reported annually, shall be received in 2007 with a view to considering further measures which may be required for meeting the long-term objective".

A new GEF project "Control of eutrophication, hazardous substances and related measures for rehabilitating the Black Sea ecosystem" was launched mid 2000 and came into force in 2001.

## BLACK SEA WATER QUALITY MONITORING IN ROMANIA

For the purposes of the *Bucharest Convention* "**pollution** of the marine environment" means the introduction by man, directly or indirectly of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazard to human health hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.

The Bucharest Convention (Art. XV Scientific and technical co-operation and monitoring) forsees:

1. "The Contracting Parties shall co-operate in conducting scientific research aimed at protecting and preserving the marine environment of the Black Sea and shall undertake, where appropriate joint programmes of scientific research and exchange relevant scientific data and information".
4. "The Contracting Parties shall, *inter alia*, establish through the Commission and, where appropriate, in co-operation with international organizations they consider to be competent, complementary or joint research programmes covering all sources of pollution and shall establish a pollution monitoring for the Black Sea including, as appropriate, programmes at bilateral or multilateral level, for observing, measuring, evaluating and analyzing the risks or effects of pollution of the marine environment of the Black Sea".
7. "Each Contracting Parties shall designate the competent national authority responsible for scientific activities and monitoring".

Also, the *Odessa Declaration* (Assessment and monitoring) emphasizes:

13. "To establish before 1997, a trend monitoring system for substances which have been identified as threatening or likely to threaten the sustainable development of the Black Sea environment" ;
14. "In order to facilitate the implementation of the provisions on assessment and monitoring":

b. "the capacity of at least one institution in each coastal state to participate in common assessment and monitoring programmes will be enhanced".

Based on above considerations, Romania is represented in the Black Sea scientific community by the Ministry of Agriculture, Forests, Waters and Environment and the National Institute for Marine Research and Development (NIMRD) "Grigore Antipa" (former Romanian Marine Research Institute/RMRI) in Constanta; the institute is "the technical operator of the national network of physical, chemical, biological monitoring of coastal marine waters and of the survey of coastal erosion". Since 1974, RMRI/NIMRD is performing the marine water quality monitoring with respect to environmental protection for decision making at central and local authority levels.

Moreover, as requested by Black Sea countries including Romania as active Part, and according to Resolution no. 3 of the Diplomatic Conference, GEF approved and launched in 1993 the Black Sea Environmental Programme (BSEP). One of its major tasks consisted in elaborating the *Strategic Action Plan for the Rehabilitation and Protection of the Black Sea* (approved October, 1996); this one specifies at chapter Assessment and Monitoring of Pollutants:

54. "A **Black Sea Monitoring System** based upon biological effects measurements and measurements of key contaminants, will be established in compliance with the Bucharest Convention. It will consist of the integration of obligatory national monitoring programmes, to be included in the National Strategic Action Plans, and an independent quality assurance system. It is advised that the Istanbul Commission develop such a quality assurance system through its Advisory Group on Pollution Monitoring and Assessment, by 1998".

One important component of BSEP is the implementation of a **regional programme** of pollution monitoring, based on national programmes.

To all previous provisions regarding monitoring and assessment of marine waters the Directives resulting from the EU environment legislation should be added. These norms concern more precisely monitoring and protection of coastal waters and shellfish waters directive. For Romania, a country aspiring to join the EU, they are compulsory.

## MARINE MONITORING PROGRAMME

The contemporary environmental degradation of the Black Sea ecosystem and particularly of its NW sector consists mainly in **coastal erosion**, chemical pollution or **eutrophication**, and long-term ecological changes including the **decline of biological diversity** and **loss of living resources** (Bologa 2001 b, 2003; Bologa *et al*., 1995).

These dramatic changes originate in the five times larger drainage system of the Black Sea than its surface itself, being affected by the economic activity of over 165 million people from 17 Danubian and Black Sea countries, consisting in: industry, agriculture, fishing (overfishing), transportation, tourism.

The major biological alterations include all components of the ecosystem: **macrophyto-** and **zoobenthos**, **phyto-** and **zooplankton**, **fish** and **mammals** (Petranu *et al*., 1999).

Since 1990 the Government of Romania pays increasing attention to adequate national policies in the field of ecology and environmental protection encouraging the participation of its appropriate institutions in monitoring and evaluating the state of the environment including the marine and coastal ones.

The monitoring of environmental quality started at RMRI within the **National Integrated Monitoring System** in 1975 considering basically the contamination of the marine environment by nutrients (N, P, Si), heavy metals (Mn, Fe, Cu, Cd, Pb), artificial radionuclides ($^{90}Sr$, $^{137}Cs$), total hydrocarbons, parasite and saprophyte fungi in emerged and submerged sediments, sea water and biota (Bologa *et al*., 1999).

The updated monitoring programme, developed by NIMRD more recently addresses the following objectives (Mihnea, 2000):

- assessment of the state of health of the Black Sea ecosystem,
- assessment of the evolution trends of marine environment quality,
- preparation of policies and measures of protection and rehabilitation,
- estimate of effect and efficiency of protection measures,
- check of respecting and framing in standards, agreements and permits issued by environmental authorities,
- fullfilment of government obligations from international programmes and conventions where Romania is signatory or participating,
- adaptation to European Union legislation.

The concept of the present monitoring strategy is based on the definition of **integrated monitoring** which includes a system of observations, assessments and diagnoses of the (marine) environment, as well as the forecast of its changes under the influence of natural and anthropogenic factors, in order of getting scientific support and recommendations for management.

The monitoring activity of the marine environment include four categories of **parameters**:

- **physical** (transparency, temperature, pH, suspended matter),
- **chemical** (in *sediments*: heavy metals, persistent organic pollutants, pesticides, PCB, oil, radionuclides; in *seawater*: salinity, dissolved $O_2$,

BOD, N-$NO_2$, $NO_3$, $NH_4$, P-$PO_4$, P organic, $SiO_4$, total organic carbon, oil, radionuclides; in *biota*: heavy metals, persistent organic pollutants, radionuclides),

- **biological and microbiological** (zoobenthos, chlorophyll *a*, phytoplankton, faecal colliforms),
- **biomarkers** (specific markers, toxicity tests).

The strategy will take into consideration the **quality objectives** for the marine environment as proposed by GEF/BSEP (Mihnea, 2000): general protection of ecosystems, harbours, recreation areas, special protected zones.

All monitoring data have to be introduced in a **database** created by NIMRD and periodically sent to following end-users:

- Ministry of Agriculture, Forests, Waters and Environment/Department for Ecological Control and Monitorig,
- National Administration Romanian Waters/ Directorate of Waters "Dobrogea-Littoral",
- Environmental Protection Agency, Constanta,
- Danube Delta Biosphere Reserve Authority, Tulcea,
- local authorities.

Monitoring issues have also been dealt with in some related research and management programmes (Bologa 1999a; b; 2000; 2001a) and in scientific events devoted to international co-operation in the Black Sea area (Bologa, 2001b; Bologa and Charlier, 2000; Mihnea, 2000).

## CONCLUSIONS

1. The Black Sea ecosystem is still in an advanced state of ecological disequilibrium.

2. There is a strong need for developing and enforcing adequate policies regarding environmental monitoring and protection in accordance with sustainable development.

3. National monitoring programmes concerning the Black Sea should be harmonized by the coastal states at regional level following the programmes, projects and co-operations such as, e.g., the GEF/Black Sea Environmental Programme, EU/PHARE Marine Monitoring Programmes, EU/ECOS OUVERTURE– UALIPOL.

4. The Romanian marine monitoring programme includes a complete network of transects and stations along the entire coast (from shore to offshore control sampling points), to evince all pollution sources.

5. Following main categories of pollutants are monitored daily, monthly, quarterly, annually and/or multiannually: physical, chemical, biological, microbiological.

6. Annual reports on the state of the environment, including the marine one, should be (in Romania are) issued and forwarded to concerned central and local authorities.

7. Marine environmental data and databases can and should be used for development of national, regional and international research and management programmes and projects.

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