

The Black Sea Circulation is dominated by a coherent current system along its periphery, i.e. the 'rim' current, and meso-scale eddies and meandering motions superposed onto this basic pattern. The influence of buoyancy input into the northwestern shelf by major rivers, among which the Danube is the largest, contributes to the instabilities of the rim current, which transports the river inputs along the periphery of the western Black Sea. Another mechanism generating intense meandering is the interaction with the abrupt topography of the Sakarya canyon along the Southwestern shelf area, near the Bosphorus. Strong cross-shelf exchanges driven by these mechanisms redistribute the lateral fluxes originating from the major rivers and straits which contribute significantly to the budget of water, nutrients, organic and inorganic particulates and pollutants. A synthesis of the scales and signatures of these circulation features is made, based on oceanographic surveys and satellite data.

The two-layer flows through the Bosphorus determine the fluxes transported to the Black Sea by the 'Mediterranean effluent', and those exported out into the Marmara Sea. Estimates of the fluxes for a number of important properties are made, based on long-term measurements in the region.

Investigations of the spreading of the Mediterranean effluent into the Black Sea have shown a very particular pattern of boundary mixing. The Mediterranean water first spreads on the shelf and becomes diluted by entraining the overlying Cold Intermediate Water, then descends the continental slope, where it generates a pattern of intrusions and secondary circulations up to a depth of 500m, aided by the double diffusive ambient environment and the temperature-salinity anomalies of the sinking slope water. This in turn sets up a larger scale vertical circulation contributing to the interior mixing. The cross-shelf exchanges determine the domain of influence of the intrusions. The filaments of anomalous water thus spread horizontally into the interior carrying the fluxes, various properties with them.

## Introduction

The importance of the economic, social, health, and recreational values of the marine environment of the Black Sea. Special hydrological and ecological features of the Black Sea; the adverse effect of the Danube and other major rivers flowing into this semi-enclosed sea. The critical state of the health of the Black Sea.

The development pressures on the management of coastal areas and the need for an integrated environmental policy and adjustment of environmental quality to development requirements through regional co-operative action.

The Convention on the Protection of the Black Sea Against Pollution (adopted in April 1992 in Bucarest as a legal basis for a regional co-operation).

The main components of a Black Sea Action Plan (BAP): legal framework for regional co-operation; coordinated measures against major sources of pollution; research and monitoring; coastal areas management programmes; institutional and organizational matters; co-operation with Danube and Mediterranean States; relations with competent international organizations, and in particular UNEP/OCA/PAC Regional Seas Programme.

The elaboration of BAP should take into account the experience of existing regional seas programmes, especially the Mediterranean Action Plan and its component the Blue Plan.

## I. Objectives and general principles of a Black Sea Action Plan

Immediate and long-term objectives: prevent, reduce and control of pollution; conservation of living resources, restoration of the ecological balance. Comprehensive character of legal, administrative and technical measures. Elaboration of additional Protocols, Annexes and other instruments having priority over bilateral arrangements.

Adoption and implementation of precautionary principles along with liability for damage, introduction of Best Environmental Practice and Best Available Technology. Implementation of general principles of international environmental law, including applicable rules and guidelines adopted by UNCED.

## II. The legal components of the Action Plan

The Convention on the Protection of the Black Sea Against Pollution and the attached instruments as a comprehensive legal framework for regional cooperation.

The obligations of the Black Sea States under other international conventions and treaties relating to pollution of the marine environment and conservation of its living resources.

## III. Co-ordinated measures against pollution of the marine environment of the Black Sea

### 1. Land-based sources of marine pollution

Implementation of the Protocol on Protection of the Black Sea Marine Environment Against Pollution from Land-Based Sources. The significance of the Montreal Guidelines for the Protection of the Marine Environment Against Pollution from Land-Based Sources of 24 May 1985, the conclusions and recommendations of the Meeting of Senior Government Officials Experts convened by UNEP in Rio de Janeiro (30 October - 2 November 1991) (Annex II on Marine Pollution from Land-Based Sources) and decisions and recommendations of UNCED in this field.

Practical measures and remedies.

2. **Pollution from vessels.** Implementation of the Protocol on Oil Pollution to the Black Sea Convention. Application of the relevant provisions of MARPOL 1973/1978 and related instruments.

3. **Pollution from dumping and hazardous wastes in TRANSBOUNDARY movement.** Implementation of the Protocol on the Protection of the Black Sea Against Pollution by Dumping, the Protocol on Co-operation in Combatting Pollution of the Black Sea Marine Environment by Oil and Other Harmful Substances, Annexes I, II, and III and Resolution 1 on transboundary movement of hazardous wastes and cooperation in combatting illegal traffic thereof. The significance of the London Dumping Convention of 1972 and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal of 1990.

Coordinated legislative, administrative and technical measures to be envisaged in the Action Plan.

4. **Pollution of the marine environment from or through the atmosphere.** Harmonization of national rules, regulations and standards.

5. **Pollution from sea-based activities under national jurisdiction.** Cooperation in the elaboration of relevant regional instruments taking into account the specific geophysical and geochemical features of the Black Sea.

6. **Cooperation in combatting pollution in emergency situations.** Implementation of the provisions of the Protocol on Cooperation in Emergency Situations and the relevant Annex, attached to the Convention on the Protection of the Black Sea Against Pollution. Cooperation with States from the Mediterranean and Danube River basin.

7. **Reporting and exchange of information.** environment impact assessment and analysis and other data relating to cooperative action against pollution. Improving communications among governments, experts, and scientists in the Black Sea countries.

## IV. Marine science and monitoring programme

The scientific components of the Black Sea Action Plan Regional Coordination of national Black Sea and monitoring programmes. Elaboration of a coherent medium-term marine science and monitoring programme, taking into consideration the conclusions and recommendations of the International Workshop on the Black Sea, held in Varna, Bulgaria, 30 September - 4 October 1991. Coordination of the marine science programmes and conducting of joint scientific cruises.

## V. Regional cooperation in the management of coastal areas of the Black Sea

Cooperation with the view to harmonize the environmental policies of the Black Sea States. Establishment of common rules, regulations, standards and recommended practices and procedures for economic planning and sustainable development and environmental protection. Involvement of private and public sectors in providing economic incentives for an integrated environmental and development considerations.

## VI. Institutional and organizational arrangements

Establishment of the institutional and organizational framework in accordance with the provisions of the Black Sea Convention, including subsidiary bodies of experts and ad hoc study groups on specific issues. Constitution of coordinating unit, taking as a model the Mediterranean Action Plan. Powers and functions of the Meetings of the Contracting Parties.

## VII. Cooperation with states from the Mediterranean and Danube river basin

Exchange of information. Participation in the meetings of the governing and subsidiary organs. Implementation of Resolution 2 on cooperation with Danube States. Examination of the problem of adopting appropriate instrument for cooperation with the Mediterranean States.

## VIII. Cooperation with competent international organizations

Establishing close working relations and cooperation with competent international organizations within the UN system (such as IMO, FAO, IIOC, UNESCO, WMO, UNIDO, UNDP, WHO, and others) and other international and regional institutions. Implementation of Resolution 3 on the establishment of close cooperation with UNEP - Ocean and Coastal Areas/Programme Activity Center (UNEP/OCA/PAC), Regional Seas Programme, particularly concerning the elaboration of a Black Sea Action Plan, providing technical assistance and equipment, training of specialists, transfer and use of best available clean and low-waste technologies, etc.

## Conclusions

The elaboration of a Black Sea Action Plan is the most essential device for the implementation of the Convention and promoting regional cooperation. This plan should identify the priorities for concerted action, taking into consideration the experience of other regional seas programmes and the conclusions and recommendations of UNCED for environment and sustainable development applicable to the Black Sea area.