"Sustainability of the Southern European Seas: Issues and Concerns"

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Maritime Day, Gijon, Spain, 19 May 2010

Sustainability Issues

- Sustainability of the seas **integrates environmental issues, economic growth and social development**
- It is a **complex process of development** with many interacting factors leading to the replenishment and stability of our seas
- **Implementation of policies and programs** should be made together with an action plan that could strengthen the sustainable use of marine resources and favourites “good” environmental conditions.
- **Ocean governance needs knowledge, skills and energy** of all socio-economic and scientific groups concerned
- Proper **education and training** in marine sciences and marine ecosystem functioning are needed and understood by all groups

Southern European Seas: Importance and Management

- The Mediterranean and the Black Sea, due to their small size, are affected by stresses sooner than the world ocean.
- Gaining better knowledge will enable prediction of possible scenarios of the state of the two seas, for better management and be used as a model for the impacts of global change.
- The Mediterranean and the Black Sea are very sensitive areas, with highly stressed ecosystems having also very high species diversity in the European region,
- Changes in biodiversity may well affect the ecosystem functioning, even in the case of invasions by a single species,
- Important consequences both to nature and society
- There are still major gaps to be covered in the field of biodiversity of the Mediterranean and Black Seas.

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Ecosystem Functioning in the SES

- Basic research on biodiversity and ecosystem functioning in a strategic way
- Improve assessment of air-sea and riverine fluxes (SESAME' s deliverable)
- Establish WOCE-type transects and stations to monitor the variability through the water-column (SESAME' s objective)
- Improve understanding of physics regarding the exchange of the two seas. Study and ecological modelling of the straits
- Develop models, with regional components, where the two Seas are fully coupled, as well as fully coupled with the atmosphere (SESAME' deliverable)
- Improve the understanding of how anthropogenic forcing (mainly eutrophication and overfishing) may lead to an increase in harmful algal blooms in SES

Ecosystem Functioning in the SES: Back to the future?….

Over the next decades:

- Ecosystem pressures are expected to increase and it is therefore imperative to predict possible scenarios depicting the future state of the two seas.
- The evaluation of a described pattern should be made by using the "tools" provided by ecological theory, in order to make scientifically sound decisions
- Work on scenaria (i.e. BAU, PT and "Deep Blue")
- Policy oriented options should be clearly upfront, be applied and enhanced
- Synthesis of the current findings of features of Med and Black Sea with their bio-ecological conditions should be used to develop a series of evaluations and projections on the possible future of ecosystems (SESAME IP Project).

Hazards and Threats

A commented list of possible threats and hazards to the Mediterranean and Black Sea ecosystems includes:

- urban pollution,
- harmful algal blooms,
- agricultural pollution,
- industrial pollution,
- coastal erosion,
- over-fishing,
- transport of alien species,
- global warming and
- an increase in the success rate of opportunistic species.

Hazards and Threats

- Scarcity of data is probably the main issue in the two regions. There are large stretches of coastal zones, with sparse records (e.g. South Mediterranean, East Black Sea)
- Processes, pathways and fate of pollutants are not well known (many past data exist but not the pathways…)
- Problems of microbial pollution in the coastal zone persist and are mainly related to urban waste water
- Changes in productivity are linked to anthropogenic nutrient loads
- Ecological indicators are needed to capture complexities of coastal systems which must be regularly monitored
- Sources of pollution and anthropogenic pressures must be identified (e.g. non-point sources in agriculture) and the biological effects of long-range pollutants must be ascertained.
- Monitoring capabilities have to be improved. Marine Strategy Directive in place

Habitats and Habitat Level

- The thermal excursion of Southern European Seas is great, with the spatial (but not temporal) coexistence of two types of biota: a cold-temperate one in the cold season (at least in the coldest parts of the basin) and a tropical one in the warm season.
- The two seasonal systems are very different in features and the greatest biological diversity (in terms of different adaptations) of the European marine biota resides in the SES.
- The habitat level is crucial for the protection of biodiversity (the EU Habitats Directive). Out of 198 habitat types recognized to be of European importance, only 9 are marine
- The list of marine species in the Habitats Directive is far from representative of the biodiversity of SES, while terrestrial species are considered in great detail.

The sustainable use of non-living marine resources

- Sustainable exploitation of non-living resources is very important in the area (unique hydrography of the Mediterranean with warm deep waters, deep-water mass formation, coupled with the extreme environmental conditions encountered in the Black Sea)
- Significant questions on the regional and global (worldwide) importance of fluid vents and associated gas hydrate accumulations are still pending
- Seabed mapping should be made; identify and study the seepage ecosystems (Ecosystem research on mud volcanoes)

Marine living resources

- Knowledge of fisheries in the two regions needs to be improved.
- The quality of fishery statistics still one of the main weaknesses and the production of good quality statistics is a major priority
- The collapse of fish stocks worldwide is indicative of management failure to sustain natural resources; management issues should be changed (since are clearly ineffective)
- In aquaculture, precise definitions of carrying capacity for fish-farms in the SES area are needed; conflicts of land and sea use with other sectors

Acquire the conceptual tools for distinguishing between “normal” and “altered” and to detect the sources of alteration

Necessity exists!

- Changes in ecosystem functioning derive from changes in the drivers of ecological processes.
- Drivers can be of **physical** (e.g. temperature increase), **biological** (sudden bloom of an opportunistic species that forms a huge population for a short time and then disappears, alien species, etc.) or of **human origin** (that must be mitigated).
- Natural systems are driven by multiple causalities so that it rarely occurs that a single cause might explain a given situation.

Management, Policy & Socio-economics

Joint efforts and activities of both natural and social sciences is a prerequisite for developing a successful management system and increase sustainability potential

- **Challenges:**
  - how to ensure sustainable utilisation of the natural resources, goods and services
  - how to avoid the creation of thresholds that will seriously hamper sustainability
- **Problems:**
  - coastal zones in both areas are heavily influenced by inland activities, especially subsidised agriculture
  - At national level, policy on the marine and coastal environment are sectoral, so decision-making remains fragmented

Improve public awareness of environmental problems

- Connecting the scientific world and the general public

A bridge is being built

- Scientists are to be taught how to communicate their findings, especially to decision makers
- Reverse the approach: Decision Makers to Scientists

Science, Policy and Economy
Long Way to go…..

- Lack of integration of science, policy and economy results in substantial financial and environmental loss
- Thresholds concept is the cornerstone of sustainability and are regional specific (e.g. response to P differs right across Med.); Threshold values are needed and have to be defined to formulate sustainable development policies (for coastal areas) and be used as a starting point for negotiating with other users
- Need to define economic costs and value of goods and services (SESAME)

What needs to be done

- Lack of consistent and reliable scientific knowledge on anthropogenic pressures and information on many processes and phenomena that are essential for policy and decision-making.
- Further studies on biological effects of pollution;
- Harmonize analytical methodologies and implementing QA procedures at regional level, in order to provide reliable data.
- Development and harmonisation of marine environment quality standards, especially in the Black Sea region, for seawater and sediments
- Coastal erosion (Black Sea in particular) needs particular attention

Suggestions for future activities….

- **Networking:** join efforts to re-develop a regional strategy for Med and Black Sea, in compliance with EU Directives and international Treaties and Conventions
- **Data base development:** creation of a central depository of reliable data from the marine environment; the paradigm of SESAME
- **Coverage:** Cover large, unexplored geographic areas and standardize methods for marine research
- **Rapid Assessment Techniques (RATs):** Develop assessment of the marine environment, integrating multidisciplinary knowledge
- **Integration:** Integrate disciplines (e.g. socio-economics, decision making, integrated coastal zone management, models)
- **Capacity building:** Increase training and education for the new generation of scientists (SESAME's activities) as there is a lack of expertise in several disciplines in the area


Thank you for your attention!