

Towards an Integrated Management and Planning in the Romanian Black Sea Coastal Zones

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Abstract: The socio-economic and “natural” systems are, to a variable extent, now locked in a co-evolutionary path, characterized by a joint determinism and complex feedback effects. The management of the coastal zones, including also modeling and assessment measures, should, be reoriented over time to properly capture the causes and consequences of the joint system changes as manifested in the coastal areas. This will require a collaborative work among a range of economical, environmental and social science disciplines. The pressures and the high instability are similar between the coast and the sea, in both senses (from the land to the sea and also from the sea to the land), being given by various factors as the strong winds, waves, storms, open sea, currents, as well well also the variability of temperatures, salinity, density, due to the Danube impact, etc. The influence of the rivers discharging into the Black Sea is important, while the coastal erosion, flooding, urbanization, tourism, naval industry have an impact on the coast and the sea environment. The Marine Spatial Planning Directive is appropriate in Romania to put in practice the similar tools, and practical approach from the coast to the maritime space. This paper aims to represent an useful starting point in the management of the coastal zones for both natural and social science research that would be sought (by a more integrated modelling and assessment process) to better describe and understand the functioning of the ecosystems, that form the coastal interface, and in particular the filter effect is exerted on nutrients in response to the environmental pressures, both anthropogenic and non-anthropogenic - the climate change, land use/cover change, urbanization and effluent treatment from both point and non-point sources. For this it is necessary a broad analytical framework (rather than a specific model) in which to set a more detailed analysis.

Keywords: integrated coastal management; coastline change; risk analysis; Black Sea shore; marine spatial planning

JEL Classification: O32

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1. Introduction

For accomplishing the main objectives required for a sustainable development in the coastal areas, it is an issue of major signification to have strategic directions such as: conservation of the coastal environment, a good management of the risks and of the coastal vulnerabilities, and merging of the coastal environment with relevant economical considerations in the decision making. (Anton, Rusu, & Mateescu, 2017) At the international Conference on Coastal Systems Studies and Sustainable Development, organized by UNESCO, it has been noted that the modern industrialized development, associated with a significant population growth, have subjected the coastal environments to severe pressures and degradation through over-exploitation of the resources, various types of pollution that may lead to the destabilization of the coastal zones, as well as the global changes that are visible with higher intensity in the nearshore (Gasparotti, 2015). It has been also observed that it is an increasing spread of the modern-style regarding the industrialized development problems such as the congestion, pollution and high resource consumption within the coastal zone that contains some of the richest and most diverse resource areas of the planet (Gasparotti & Rusu, 2012).

At present, there are a variety of regulatory processes by which the licenses, permits and other authorizations have to be obtained for specific proposals or activities in the coastal areas, such as the transport, fisheries, or offshore drilling. Some regulators can impose restrictions on activities such as in the Danube Delta Biosphere Reserve marine area or the Vama Veche - 2 Mai Marine Protected Area (Ivan et al., 2012).

These regulatory regimes are changing over time due to the developments of the activities in the marine environment and the status of the marine ecosystem (for example the diminishing of the fish stocks due to the over fishing that implies restrictions on the fishery activities, exploration and extraction of the oil, buildings or extensions of the ports and other infrastructure measures). Some of these regulatory processes have a spatial dimension, in the sense that there are defined areas of the sea, where particular activities are promoted or restrained (JICA, 2007).

On 23 July 2014 it has been elaborated the DIRECTIVE 2014/89/EU of the European Parliament and the Council establishing a framework for Maritime Spatial Planning which entered into force in September 2014. The European Parliament and the Council have also, under discussion and debate a proposal for establishing a framework for maritime spatial planning and integrated coastal management, launched on 12 March 2013, at present being provisory (Onea & Rusu, 2014).

Based on these two important documents, important objectives and steps for *maritime spatial plans and integrated coastal management strategies* have been

underlined, applicable to all EU countries and seas. They are mainly (Onea et al., 2015):

- The member states will be required to establish and implement maritime spatial plans and integrated coastal management strategies.
- Maritime spatial plans should map the actual and potential spatial and temporal distribution of maritime activities in marine waters.
- The integrated coastal management strategies that should contain an inventory of the existing measures applied in coastal zones and an analysis of the need for additional actions in the appropriate management of the activities in coastal zones.
- The plans and strategies need to be mutually coordinated and to be reviewed at least every 6 years.
- All relevant stakeholders and authorities should be appropriately consulted on the draft plans and strategies and should have access to the available results once.

Plans and strategies must be based on the best available data, which should be collected through the use of existing instruments established in other EU initiatives.

- Member States must cooperate with the third countries to ensure that all plans and strategies are appropriate in coastal and marine regions.
- Plans and strategies must be subject to the applicable procedures for strategic environmental assessments.
- Member States should designate the authority or authorities to implement the Directive and report to the Commission on the implementation of the Directive on a regular basis (Onea & Rusu, 2016).

2. Current Situation of the Integrated Management and the Maritime Spatial Planning Framework in Romania

In Romania, the delineation is made according to the Governmental Emergency Ordinance no. 202/2002 regarding the coastal zone management approved with further modification and amendments through the Law no. 280/2003, and in compliance with the methodology concerning the public domain delineation of the state in the coastal zone, since 7 April 2004.

One of the first questions that are affiliated with the management process of the integrated coast is: “How far into the inland and how far from the shore to the sea must the coastal zone expand”. Even if in Romania the coastal zone is officially defined, for the planning and scientific reasons, in Europe it is considered to stretch 12 nautical miles in the territorial sea and a strip of 10 km inland, so it may include the most of the large coastal cities (Fig. 1) (Rusu, 2014).

The discussions about this region, in the national and international political documents as the coastal zone may be characterized and determined using the following criteria: physic-geographic, geologic, social, cultural, ecosystem, economic, administrative and legislative. (Zanopol et al, 2014)

If till now this delineation hasn't been done, in the present the aim is to have a more stable precision on the principles regarding the delineation and definition of the coastal zone as well as the assertion about the measurements for its integrity assurance (Rusu & Măcuță, 2009).

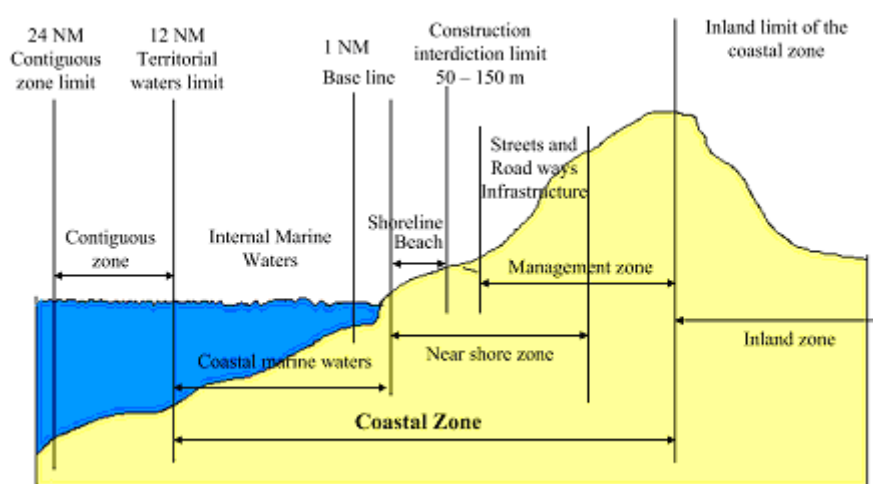


Figura 1. The coastal zone elements

The coastal system vulnerability is specifically determined by the coastline sectors, where the intervention of human activities is or isn't directly felt: the littoral that is evolving in a natural regime and the littoral that is constructed. Here the constructions have been developed in time. The hydro-technical coastal structures and the installations made for the economic activities, as for example: ports, similar structures or adjacent, and for the development and protection of the coastal zone: seawall, revetment, bulkhead and consolidation (Rusu et al, 2014).

The coast line is considered the essential aspect of the determination process. In this case, Article 9 of the Methodology/07.04.2004 states the following: From the technical point of view, in the coastal zone the delimitation of the public domain of the state will be based on the configuration position and the surface measurements located on both banks Of the shore. "Based on the above-mentioned aspects, the following functional areas may be declared including areas of interest" (Anton et al., 2017):

1. Coastal dry land:

1. Protected DDBR zones;
2. Historical monuments: ancient castles;
3. Industrial/harbor zones: Midia, Constanta South-Agigea, Mangalia;
4. Tourist zones: Mamaia, Mangalia resorts;
5. Agricultural/forest zones: Agigea, Eforie South, Tuzla, Costinesti, 23 August, Comorova Forest, Limanu;
6. Residential arias: Coastal municipal incorporated space;
7. Military zones: Corbu and Mamaia Sat firing ranges.

2. Coastal marine zones:

1. Reserves: Vama Veche Underwater Reserve;
2. Oil extractions and underwater pipes: Midia continental shelf;
3. Transport sea routs: for the 3 ports;
4. Industrial fishing zones: on the whole coast - some have passive fishing, others active;
5. Tourist navigation: Tomis, Belona, Costinesti and Mangalia ports;
6. Military navigation: Mangalia and Constanta ports;
7. Zones with an economic potential that have a series of explicit conflicts of interest, in the economic activities and in the coastline ecosystem component;
8. Harvesting grounds for mollusks: Shellfish Directive (Rusu, 2010).

Likewise, based on the criteria of using and managing (Fig. 2), the coastal zone will be classified into the following functional zones that can be relatively delineated to the coastline position (Article 9 of the Methodology/07.04.2004 (Rusu & Ivan, 2010):

a) In the northern sector:

- Terrestrial zone;
- Strictly protected areas;
- Buffer areas;
- Economic zones.

b) In the southern sector:

- Terrestrial zone;

- Tourist beaches;
- Undeveloped beaches that include dunes and sand vegetation;
- Cliff zones;
- Natural reserves.

c) In the southern sector:

- Land-sea interface zones;
- Ports and related constructions;
- Hydro technical constructions - submerged and emerged for the coastline protection;
- Work consolidating cliffs.

d) In the northern and southern sector:

- Marine zone;
- Waterways and harbors;
- Military sector for specific mission - exercises for vessels;
- Shellfish farms.

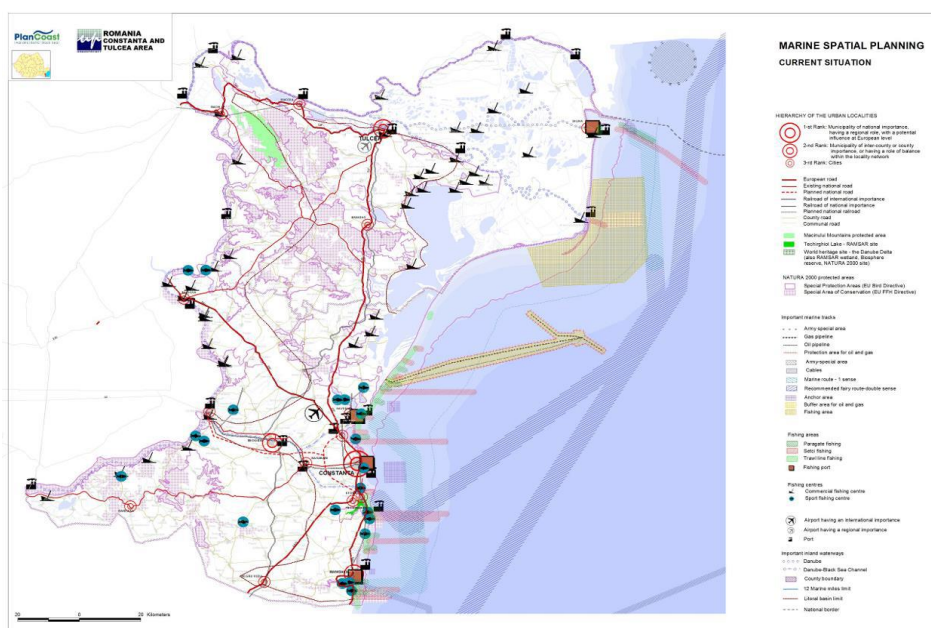


Figure 2. Integrated Maritime Map (PlanCoast) (Source: Urban-INCERC Bucharest and NIMRD Constanta, 2007)

Different kinds of approaches for the spatial planning and integrated management in the aim of planning methods are presented in the following diagram (Fig. 3) (Rusu et al, 2014).

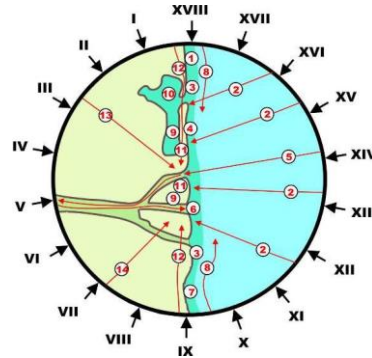


Figure 3. An example about the interaction of natural and anthropogenic factors in the coastal zone of the Black Sea

Table 1. Legend for Figure 3

Natural factors assessment		Anthropogenic factors assessment		
1. High diversity, number and biomass of vegetation and animals in the contour (boundary) biotopes of the sea	8. Wintering and feeding migration of young fish along the coast.	I. Industry	VIII. Night entertainment facilities on shore	XVI. Ecological control
2. Spawning migration of fish from the high sea towards the coast	9. High number and biomass of organisms in limans, lagoons and river deltas	II. Agriculture	IX. Extraction of living resources	XVII. Ecological education and upbringing
3. Feeding of young fish at coasts	10. Feeding of sea fish and their fry in limans and lagoons	III. Cattle farming	XI. Artificial reefs	XVIII. Complex management of the coastal zone
4. Feeding of adult fish at the coast	11. Nesting of colonial and other bird species in river deltas and limans	IV. Fishery	XII. Sea transport	
5. Spawning migration of transitory fish from the sea into rivers	12. Seasonal migration of birds having their stay in the coastal zone	V. Hydraulic power industry	XIII. Dumping	

6. Passage of young fish from rivers into deltas and in the coastal zone of the sea	13. Striving of land birds to the coastal zone	VI. Municipal facilities		
7. Wintering migration of adult fish along the coast	14. Striving of land mammals to the coastal zone	VII. Resorts	XV. Coast protection	

The structure of the economic activities in the coastal areas is covering the marine and offshore zones, but also the inland activities (Table 2).

Table 2. The structure of the economic activities related to the coastal zone

Main Fields		Activities
1	Marine transportation	Services for the passenger and cargo fleet, port facilities and land-based infrastructure
2	Offshore operations	Activities pursued on the fleet, at floating factories, in fishing ports, canneries and fish breeding
3	Sea industrial cycles	Development of the raw resources of the shelf and the World Ocean
4	By-port industrial production	Industrial processing of the export and import raw materials
5	Recreation	Services for the resort and recreation industries and public tourist facilities
6	Export/import and technical activities	Formation of special economic zones, joint entrepreneurship and establishment of technopolitan sites and technological parks

The consideration of the impact of the anthropogenic factors evaluation permitted, for the beginning, to focus the attention on various activities, uses and impact factors on the coastal and marine ecology. There were registered the following fields of the activities and their impacts (Table 3) (Gasparotti, 2015).

Table 3. Fields of the activities and their impacts on the sea and coast

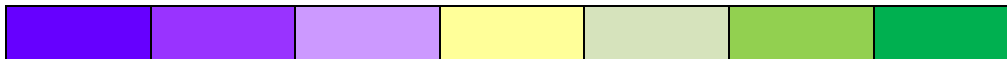
IDENTIFIED FIELD	CORRESPONDING ACTIVITIES
Industry	- pollution with sewage containing chemical and radioactive substances
Agriculture	- pollution with organic and mineral substances, pesticides in water and soil, soil erosion, sea bottom silting, eutrophication
Cattle Farming	- pollution with sewage, eutrophication
Fishery	- genetic degradation of natural populations resulting from release

	into water bodies of the breed which was obtained by crossing closely related fish
Hydraulic Power Industry	- obstacles for spawning migration of transitory fish
Municipal Facilities	- pollution with sewage and storm waters, microbial contamination
Resorts	- pollution with sewage water, microbial contamination
Night entertainment facilities on shore	- noise and light pollution of the coastal zone
Extraction of living resources	- reduction of the numbers of the individual populations of industrially extracted species
Extraction of mineral resources	- ruination of bottom communities, bottom silting
Artificial reef construction	- increase of the number of attachable plants and animals, spreading of filtering organisms
Sea transport	- ruination of the costal bottom communities, advent of alien species
Dumping	- ruination and destruction of bottom communities, bottom silting
Coastal protection	- worse habitat conditions, establishment of stagnation sites in the coastal zone
Environmental protection	- positive consequences
Ecological control	- positive consequences
Ecological education and upbringing	- positive consequences
Complex management of the coastal zone	- positive consequences

Taking into consideration all these activities and their impacts on the sea and the coast, it can be created a matrix of expert assessments concerning the ecological processes and conflicts in the coastal stretch of the Black Sea (Rusu, 2015).

Table 4. Consolidated matrix of the expert assessments concerning the ecological processes and conflicts in the coastal stretch of the Black Sea

LEGEND:



Effects: 1- extremely negative; 2- negative; 3- rather negative, than positive; 4- undefined; 5- rather positive, than negative; 6- positive; 7- extremely positive.

Factors: I. Industry, II. Agriculture, III. Fishery, IV. Marine shipping, V. Communal services, VI. Coast protection, VII. Hydro power engineering, VIII. Resorts, tourism, IX. Nature conservation, X. Environmental education.

Consequences Causes	Changes in habitation conditions							Biological and general changes							
	Salinity	Currents	Transparency	Pollution	Trophic status	Bottom sediments	Oxygen	Restlessness	Quantity	Diversity	Bottom hypoxia	Stock	Health hazard	Food quality	Aesthetic quality
Bioresources extraction															
Mineral extraction															
Industrial effluent disposal															
Chemicalization															
Soil erosion															
Agricultural effluent disposal															
Residual forage															
Inbreeding															
Development of ports															
Dredging, damping															
Ballast waters disposal															
Ship wrecks															
Municipal effluent disposal															
Rainfall effluent disposal															
Beach widening															
Hydraulic works															
Dams															
Reservoirs															
Resorts development															
Domestic effluent disposal															
Sports, entertainment															
Devipt of protected areas															
Environmental control															
Artificial reefs															
Lectures															
Extracurricular education															
Books, posters, films															
Integrated coastal zone management															

The comparative analysis of the existing measures and the results obtained led to identifying other important needs, under the institutional, environmental and social aspects (Gasparotti & Rusu, 2012):

- Institutional needs:
 - The need for legal support frameworks;
 - The need for capacity development;
 - The need for inter-sector decision-making;
 - The need to address multi-use conflict through MSP;

- The need for stakeholder-based planning.
- Environmental needs:
 - the catalytic role of the MSP for sustainable development;
 - The need to address multiple cumulative impacts.
- Social needs:
 - MSP complements traditional management approaches;
 - Reconciliation of top-down plans, which are planned on a large scale, with bottom-up management at the highest level and more localized (Gasparotti & Rusu, 2012).

The intersectoral approach between the economy and the coastal environment is only sustainable if the risks are low. (Table 5) (Zanopol et al, 2014)

Table 5. Necessity of risks, avoiding according with a significant necessity of investments in infrastructure (Zanopol et al, 2014)

SUBJECTS	OPPORTUNITIES	RISKS
Energy and Pipelines	New pipelines Fossil fuel development Marine renewables Regional development	Increased the oil transportation and Bosphorus strait constraints Environmental damage associated with the new energy transport Need for effective communication Infrastructure development
Transport	Growth of shipping Development of ferry services Short sea shipping Cruise activity New infrastructure Gas and oil shipping Leisure development	Substandard for shipping and maritime accidents Administrative barriers for shipping
Environment	Improved monitoring and communication Implementation of EU regulations and regional agreements	Eutrophication Nutrient enrichment Marine living resources biodiversity
Economic Use	services related to the energy transport infrastructure development agriculture development increased tourism	low investments in the infrastructure administrative barriers environmental pressures caused by land use

3. Conclusions

The economic activities of the municipalities along the Black Sea have a particular significance for the protecting the sea and coastal environments. On the other hand, the economic use of the coastal zone quite often denies the opportunities for some other activities. The construction of the coastal highways also limits the development of the coastal tourism and wildlife reserves. The construction of the hotels on the beach in the immediate vicinity of the shore puts a burden of waste from the human activities on the environment, on the quality of the beach and usually deteriorate coastal waters.

An integrated approach for the coastal area is required to ensure that the Romanian coastal zone is environmentally and economically sustainable, as stated in the National Plan for the Integrated Coastal Zone Management (draft emission 2006-2007), which is the main document concerning the Romanian ICZM strategy. This allows the coordination of multiple and often contradictory interests. It also provides directions for the desired developments in the most important economic sectors of the coastal zone (agriculture, tourism, industry, infrastructure, international trade and fisheries), taking into account the need to protect the environment.

The strategy herewith proposed also is considered as a long-term policy document, taking into account the highest social, economic and ecological benefits for the present and future generations. Relevant elements of the Romanian long-term strategy should be translated into medium-term policies and short-term action plans for the relevant sector agencies in a coordinated and integrated manner. Furthermore, a long-term perspective, in order to preserve the environmental, cultural and heritage appeals, is taken into account in the sustainable development.

4. Acknowledgement

This work was carried out in the framework of a research project supported by the Romanian Executive Agency for Higher Education, Research, Development and Innovation Funding – UEFISCDI. This acronym of this project is ACCWA (Assessment of the Climate Change effects on the WAve conditions in the Black Sea), grant number PN-III-P4-IDPCE-2016-0028.

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