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Instrumente Structurale 2007 - 2013

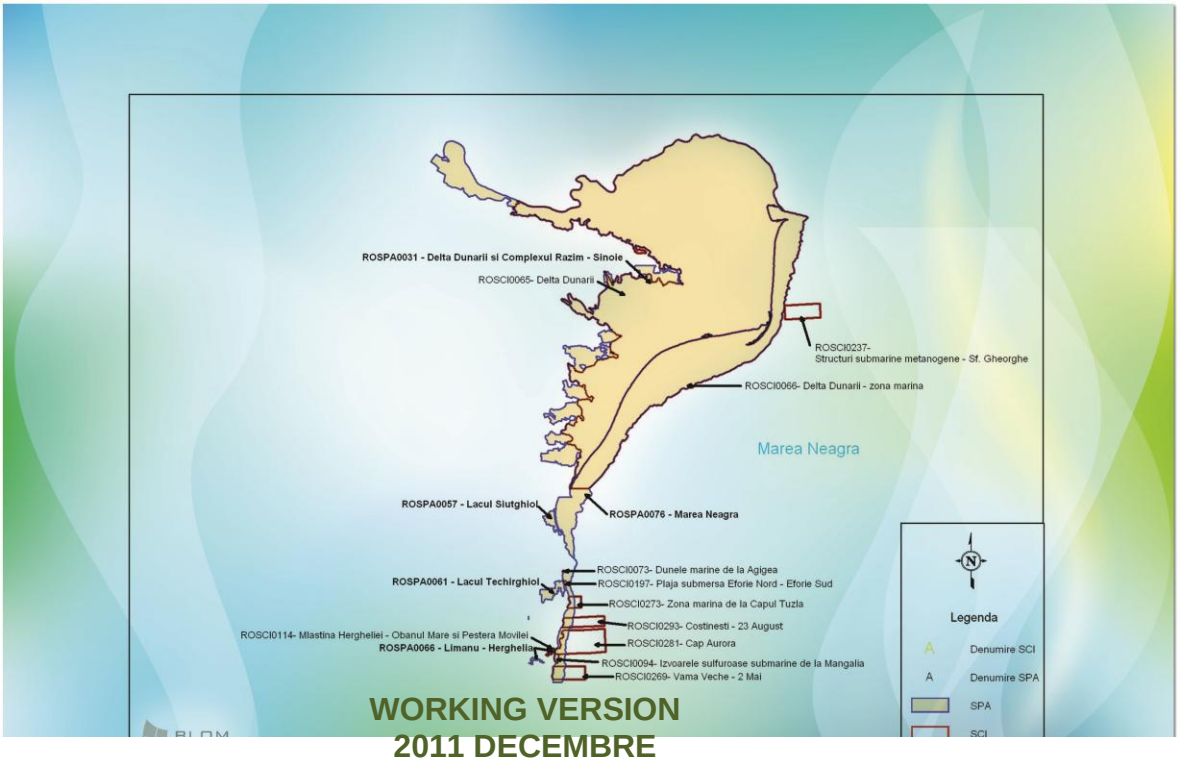
TEHNICAL ASSISTANCE FOR PROJECT PREPARATIONS AXIS 5

The implementations of appropriate structure to prevent natural hazards in most vulnerable areas

Kea Area of Intervention 2 – The reduction of coastal erosion

THE STRATEGIC ENVIRONMENT ASSESSMENT (SEA)

ENVIRONMENTAL REPORT



WORKING VERSION

2011 DECEMBRE

www.blomasa.com office@blominfo.ro

Sec I.H.Rădulescu, Nr. 3-5, Mun. Târgovişte, Jud. Dâmboviţa, România, 13

Bu l, Nr. 87, et.3, sector 1, România, 14146, Tel: +40 31 437 01 24, Fax: +4

Co 3 A, et. 8, Mun. Constanţa, Jud. Constanţa, România, 900591, Tel/Fax:

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INTRODUCTION

This document represents the Environmental Report made for Strategic Environmental Assessment procedure of the 'Coastal protection and rehabilitation" Master Plan.”Romanian Waters” National Administration by the Administration Water Basin Dobrogea - Litoral, as holder of the "Coastal Protection and Rehabilitation" Master Plan has the obligation of browsing the procedure of environmental assessment for plans and programs, for issuancing by competent authority for environmental protection, the environmental notice, confirming the issue of environmental protection in Master Plan.

Strategy and national policy for water management is to create a sustainable water management policies by providing quantitative and qualitative water protection, defense against the destructive action of water and turning water potential in relation to society and sustainable development requirements in accordance with European directives in the field. " One of the five (5) set specific objectives to achieve this policy is the development and implementation of protection and rehabilitation of the Romanian Black Sea coast against erosion and promoting integrated coastal zone management, as recommended in the field.

Strategic Environmental Assessment (SEA) Master Plan for coastal protection and restoration was done by following the steps set out by GD 1076/2004, namely:

a) screening stage of the plan or program environmental assessment procedure;
b) the stage of finalizing the draft plan or program and the achievement of the environmental report;
c) stage of analysis quality environmental report.

Depending on the stage of the SEA, we chose for combining the following descriptive, analytical and interactive methods:

- Consultation (Working Group) in the scoping stage,
- Setting benchmarks and consultation (Working Group) for stage monitoring
- Multicriteria analysis, and consultation (Working Group and public consultation).

Working Group established under the Master Plan SEA process and coastal zone protection included representatives of the following institutions:

- Water Basin Administration Dobrogea - Litoral, owner of the Master Plan
- Ministry of Environment and Forests (MMP)
- Impact Assessment and Pollution Control Department
- Department of Water Resources Management
- Biodiversity Department
- Waste Management Department and Hazardous Chemicals
- Climate Change and Sustainable Development Department
- Ministry of Health
- Ministry of Regional Development and Tourism
- Ministry of Interior
- Ministry of Agriculture and Rural Development
- Ministry of Transport and Infrastructure
- National Research Institute - Marina Development "Grigore Antipa"
- Custodians of natural protected areas or Natura 2000 sites in the area of interest

In accordance with Article 14 of Government Decision 1076/2004, the Working Group were analyzed to assess the possibilities on the Master Plan and the level of detail of information to be included in the environmental report. In the strategic environmental assessment of the Master Plan, analyzing how the plan's objectives contribute to achieving environmental objectives relevant to consider the potential significant environmental effects if not implemented or its implementation plan, as follows:

- ***Analysis*** of the ***environment*** in the interest of the Master Plan, the existing data and information support;
- Identifying ***environmental aspects and environmental issues*** relevant to the domestic / regional / local Master Plan for which an appeal may direct;
- Identification / formulation of ***relevant environmental objectives*** which the Master Plan has to respond to environmental issues and environmental issues identified
- Analysis of the environment in terms not implemented the provisions of Master Plan - Alternative 0
- ***Evaluation of environmental effects*** of alternatives considered in Master Plan and justified the lternative chosen by evaluating how the proposed objectives and measures contribute to the achievement of relevant environmental

Environmental Report is an important tool for integrating environmental considerations into the preparation and adoption of plans and programs as it provides the identification, description, evaluation and consideration in this process has the potential significant environmental effects. Developing the environmental report and the integration of environmental considerations in preparing the Master Plan is an iterative process that should contribute to sustainable decisions.

CHAPTER 1. Content and the main objectives of the Maste Plan, the relationship with other plans and programs

1.1. Master Plan Study Area

Area of interest analyzed in this Master Plan stretches from Musura Bay at north (border with Ukraine) and Vama Veche at south (border with Bulgaria). Area of interest is divided into two main units, namely:

- ***Northern Unit,*** between Musura Bay and Cap Midia, having a length of about 165 km and a width within the administrative territory of Tulcea and Constanta county, 400m, and
- ***Southern Unit,*** between Cap Midia and Vama Veche, with an approximate length of 82 km and a width within the administrative territory of Constanta County of 200m. (Fig. 1.1.1 and 1.1.2). Offshore area of interest of Black Sea for the development of Master Plan extends from the shoreline and is generally limited by water depth 15m isobath.

Fig 1.1.1 Interst Area of Master Plan

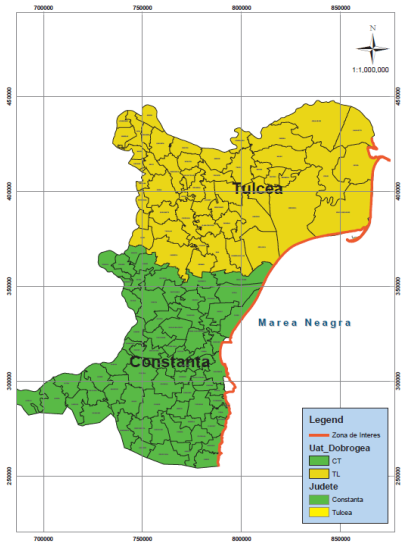


Fig.1.1.2. Administrative Territorial Area

The study area of Master Plan includes 19 administrative units between the north and south borders of the Black Sea coast. These include 2 municipalities (Constanta,Mangalia), 3 cities (Sulina, Navodari,

and Eforie), 14 communes (C.A. Rossetti, Sfantu Gheorghe, Murighiol, Jurilovca, Mihai Viteazu, Istria, Corbu, Mihail Kogalniceanu, Agigea, Tuzla, Costinesti, 23 August, Limanu) of 38 villages that belong to the twocounties, Tulcea and Constanta.The administrative territory of the localities has an area of about 317.000 ha and hosts communities whose population exceeds 458. 500 inhabitants. The interest area of the Master Plan is characterized by the dominance of the valuable natural landscape in the northern sector and a high level of urbanization (Constanta county is the most urbanized county of Romania) in the southern sector.In terms of sedimentary processes near the coast and coastal morphology, coastal area can be subdivided into sediments cells. Coastal sediment cells are defined as units of coast where natural processes are relatively autonomous and there inputs (sources), transported volumes (sediment transport) and outputs (wells or deposits) sediments necoezive distinct. Changes along the shoreline sediment cell is generally independent of changes in the cells either upstream or downstream, though, where there is partial boundaries for coarse sediment transport or border is mobile, it is essential that links be taken into account. In the sedimentation cells were defined sub-sectors (see Coastal Dynamics Report, section 3.1.2). These are not independent of each other in terms of coastal dynamics and therefore, the links between them should be considered when assessing changes in the coastline. Boundaries between sub-sectors were chosen to fit with previous research and analysis conducted on the Romanian coast, with links to administrative boundaries. Table 1.1.1 lists the cells and sub-sectors of both sedimentary sedimentary major units major,both northern and southern.

Sedimentary cell	**Sub-sector**
Northern Unit of the litoral	
Musura Bay- Jetelele de la Sulina	Musura Bay (the state border till Jetelele Sulina)
Jetelele from Sulina - Zatoane (the south end of Sahalin Island)	Sulina
	Probe Channe
	Casla Vadanei
	Sf.Gheorghe
	Sahalin
	Secunadry delta Sf. Gheorghe corresponding to Ciotic Channel
	Ciotic - Zatoane (litoral behind the South part of Sahalin Island and wet lands system Zatoane)
Zatoane – Media Port	Perisor
	Periteasca
	Portita
	Periboina
	Chituc
	Corbu (Midia Cape)
Southern Unit of the litoral	
Mamaia Golf – Midia Cape till	North Navodari

1.2.The overview of the Master Plan concerning the Coastal Protection and Rehabilitation. The objectives of the plan .

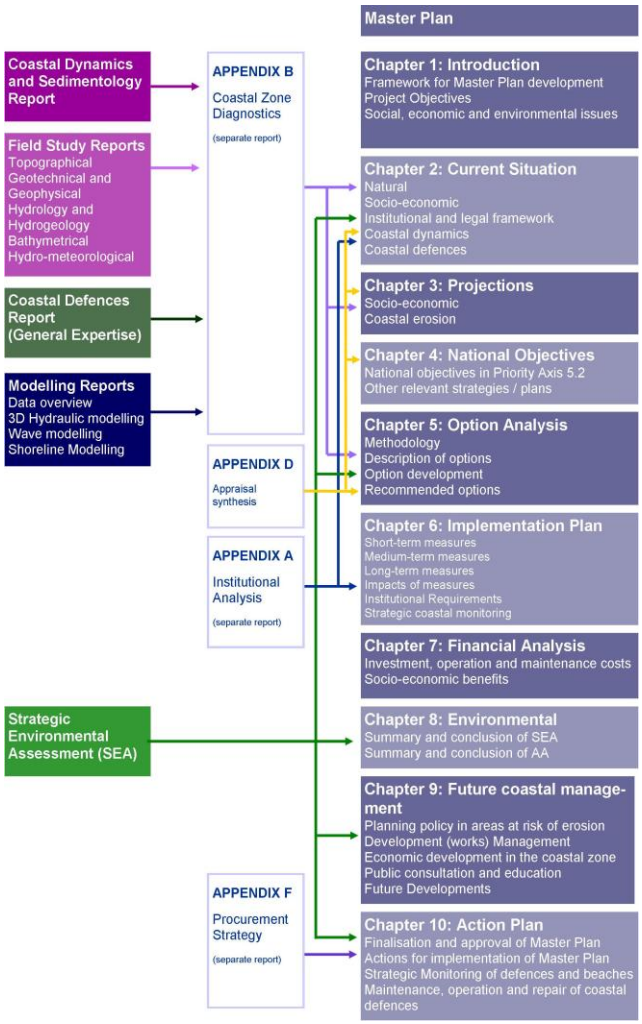
Master Plan sets out priorities for the coastal zone of the Romanian shore, with a strong focus on restoring and improving the environment. An important requirement for developing the best technical solutions in the Master Plan was to establish a thorough understanding of what causes erosion threat, and what is at risk if we do not intervene at all. In this context, there was a need to properly understand and study the geomorphology and evolutionary history shoreline area, including both natural and manmade influences.
The development of this Master Plan included, therefore a review of geomorphological vast area with existing studies, published literature, new field studies, hydraulic studies and modeling of sediment and expert interpretation of data. Master Plan will consider also non-structural measures as a strategy to reduce future risks, such as avoiding development in areas at risk of erosion and coastal adaptation to changes through relocation or land use change.

For developing the Master Plan, the following steps were done:

- analyze the existing situation in terms of the state of existing hydrotechnical constructions and state levels of coastal erosion through field studies and analysis of all available data and dividing areas according to degree of erosion risk.
- determining critical points in the studied area in terms of coastal erosion and forecasts on the evolution of coastal erosion in the situation without implementation master plan and in case performance of the works necessary for achieving the master plan.
- analysis of possible variants to be applicable for each area separately taking into account all restrictions imposed by law, the cost and the environmental report and the conclusions of the study of proper assessment.
- forecasts on the evolution of coastal erosion in the situation without the implementation of Master Plan and in case of performance the works necessary for achieving Master Plan
- analysis of possible variants to be applicable for each area separately, taking into account all restrictions imposed by law, the cost and the environmental report and the conclusions of the study of proper assessment
- determining methods of intervention for each case taking into account environmental impact and impact on species and habitats in protected natural areas in the studied area dseclarate
- establishment of coastal zone management strategy for the next 30 years
- drawing up an action plan to implement the master plan with short-term measures, medium and long

- prepare a monitoring plan
- establish how maintenance, operation and repair of existing erosion protection structures

The content of this Master Plan and its correlation with subsequent studies and consultations with stakeholders is shown in the diagram below:



The following aspects are taken into account by the Master in order to establish measures to control erosion risk, namely:

Northern Unit of Romanian coast : Danube Delta

The Danube Delta is the only delta in the world designated as a Biosphere Reserve. Iti is also a designated UNESCO World Heritage Site, European Union Special Protection Area and Ramsar site. It is the third largest delta in Europe after the Volga and Kuban Deltas. It supports one of the largest wetlands in the world and is afforded the highest protection at an international level due to its diversity of ecosystems and internationally important waterfowl. In the last 35 years the shoreline has retreated between 180 to 300 metres in places and some 80ha/year of the beach has been lost. The ongoing coastal change is largely due to natural processes, but these have been strongly influenced by changes in the Danube catchment and major interventions on the coast for navigation

Southern Unit of Romanian Coast of Black Sea

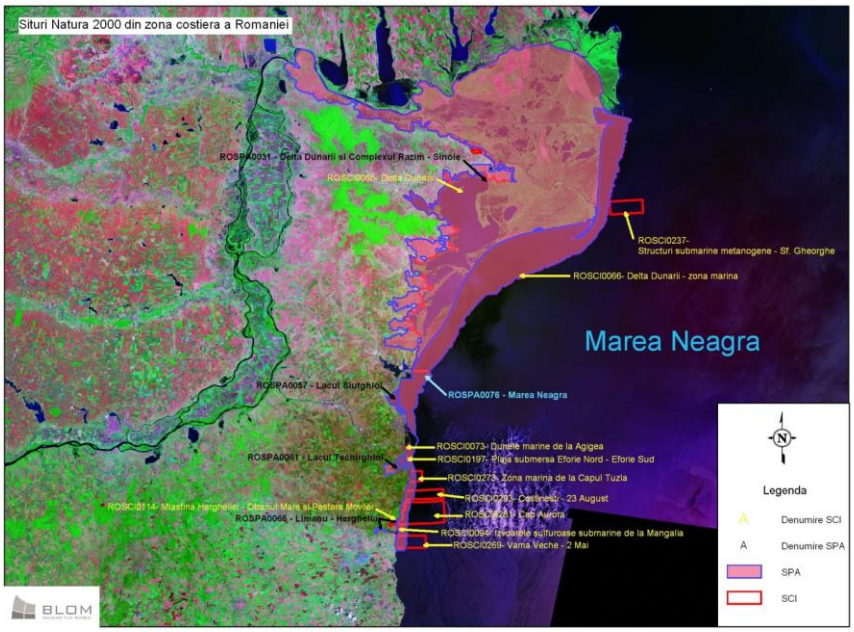
The three major Romanian Black Sea ports at Constanta, Midia and Mangalia are highly important to the national, regional and local economy and are socially important as a major source of employment in the coastal zone. However, the breakwaters that were constructed to form these ports between about 1970 and 1980 significantly modified the coastal dynamics in the Southern Unit.The southern unit of the Romanian coast between Midia and Vama Veche is of national importance for the economic, social and amenity value related to the popular seaside resorts. The tourist resorts are nationally recognised as important regional, national and international holiday destinations, attracting more than 8 100 000 visitors per year. However, this value is being adversely affected by the accelerated erosion of beaches and poor condition of the coastal defences, many of which are past their serviceable life and pose significant heath and safety risks to the public. The problems are compounded by the lack of significant contemporary sources of sediment supply and the impacts of past development .The water quality status of the Romanian shore coastal waters is largely determined by the Danube, which is responding to the cumulative pressures of all the Danube Basin, to the Black Sea, bringing in large amounts of the annual intake of pollutants. In some locations the coastal defences that were built to retain beach have exacerbated the issues with water quality by creating small enclosed bays that trap algae and pollution, damaging the environment.

Master Plan area of interest is rich in habitats protected by specific legislation, therefore, in developing the Master Plan, their sensitivity is an essential element in establishing the point that subsequent work will be done to protect and rehabilitate coastal zone.

ROSCI0065 Delta - the only habitat that may be affected are: "sandbanks covered by a layer of small permanent of sea water "(1110) and" coastal lagoons "(1150), the rest being land.

ROSCI0066 Delta Marina area - Habitats that may be affected are: "sandbanks permanently covered by a layer than seawater" (1110), "sand and swamps covered by seawater at low tide" (1140), " melee and bays "(1160).

ROSCI0237 Submarine structures methanogenic Saint George - habitats that may be affected are: "submarine structures made by leaking gases" (1180).



ROSCI0197 Submerged Beach North Eforie and Eforie South - habitats that may be affected are: "Sandbanks covered by a layer of small permanent of sea water "(1110)," sand and swamps covered by seawater at low tide "(1140)," Rock of *Mytilus galloprovincialis* infrashore *"(1170);*

ROSCI0273 marine area from Cape Tuzla - habitats that may be affected are: "sandbanks permanently covered by a layer than seawater" (1110), "sand and swamps covered by seawater at low tide" (1140) and "reefs" (1170).

ROSCI0094 underwater sulphurous springs in Mangalia - which can be influenced habitats are permanently covered sandbanks small layer of sea water "(1110) and" reefs "(1170).

ROSCI0281 Cap Aurora - habitats that may be affected are: "sandbanks permanently covered by a layer than seawater" (1110) and "reefs" (1170).

ROSCI0293 Costinesti - 23 August - habitats that may be affected are: "sandbanks permanently covered by a layer than seawater" (1110), "sand and swamps covered by seawater at low tide" (1140) and " Reefs "(1170).

ROSCI0269 Vama Veche-2 - habitats that may be affected are: "sandbanks permanently covered by a layer than seawater" (1110), "sand and swamps covered by seawater at low tide" (1140) and "reefs" (1170).

ROSCI0073 Marine Dunes from Agigea - habitat that can be influenced is "fixed dunes with perennial vegetation herbacee (gray dunes)" (2130 *)

ROSCI0114- Mlastina Hergheliei – Obanu Mare and Movila Cave - habitats that can be influenced by anthropogenic activities are "rivers of the plains, to the mountain vegetation of Ranunculion fluitantis and Callitricho batrachion" (3260) and "deciduous shrubs Ponto - Sarmatian "(40C0 *)

Master Plan area of interest integrally overlaps over ROSPA0076 Black Sea, bordering and possibly influencing the following bird protected areas: ROSPA 0031 Danube Delta and Razim - Sinoe Lake complex, ROSPA0057 Siutghiol Lake, ROSPA0061 Techirghiol Lake and ROSPA0066 Limanu - Stud.

The overall objective of this Master Plan is to protect and improve the quality of the environment and standards of life along the Romanian Black Sea Coast and to increase safety in the southern area of the coast which has been severely threatened by the destructive effects of coastal erosion.

Specific objectives focus on:

• Developing a programme of coastal protection and rehabilitation works to rehabilitate and protect the adjacent shoreline and land, and marine ecosystems
• Protect economic infrastructure and social objectives in distress as a result of erosion
• Implementation of an integrated coastal zone monitoring programme to support the delivery of operation and maintenance works in the medium and long term (30 years).

In order to meet these objectives in a sustainable way there are a number of social, economic and environmental issues that need to be considered together. These are summarised in Section 1.4 below

	The Specific Objectives of Master Plan	
I. OBJECTIVES OF SUSTAINABLE DEVELOPMENT		
OS1	Environmental issues must have absolute priority while maximizing supply relevant information on social and economic aspects.	Quantification of environmental issues to consider social and economic issues relevant
OS2	Strategic options and risk management measures for erosion management should avoid, if possible, employment protection for future generations to inflexible	Prioritization of measures taking into account the needs of this

	and expensive options.	
OS3	Reduction of erosion risks that may affect current characteristics of the environment, communities, property and infrastructure networks.	Hierarchy of risk of exposure to erosion, identifying most vulnerable areas.
OS4	Develop a structured long-term plan as justification for the proposed risk management measures for coastal erosion,	In the evaluation of vulnerability to erosion, will prioritize intervention measures in the short term (until 2013), medium (2014-2020) and long (2021-2041)
OS5	Providing recommendations on implementing the package of strategic long-term monitoring, to base future plan updates	Identification and quantification of monitoring indicators that will be in support for the periodic review (5 years) Master Plan
ENVIRONMENTAL II.OBIECTIVE		
OS6	Substantiation Master Plan on a thorough understanding of coastal dynamics and erosion causes and impacts	Evaluation of environmental impact erosion and population safety
OS7	Solution approach based on consideration of natural processes to avoid future unnecessary load protection structures	Identification and initial assessment and post-implementation monitoring of natural processes determining
OS8	Develop proposals for sustainable solutions for environmental restoration of coastal	Identifying the best solutions available techniques and best practices for implementing them
OS9	Orientation Master Plan for consideration and support sustainability objectives and protected areas	Evaluation Master Plan proposals impact on protected areas
OS10	Avoidance, mitigation and / or offset negative impacts of coastal protection works on protected areas	The solutions proposed by the Master Plan will consider the recommendations of the environmental assessment
OS11	Recommendation sustainable solutions to improve coastal water quality by improving the natural washing beaches in resort areas	The solutions proposed by the Master Plan will help achieve good water status
OS12	Develop recommendations taking into account the necessary adaptations to future climate change impacts	Master plan will consider evidence of climate change impact assessment studies and recommend adaptation to climate change in coastal
SOCIAL III.OBIECTIVE		
OS13	Improving the safety of persons who visit, live or work near the coast.	Increased safety of coastal population
OS14	Providing advice on the risk of erosion, the purpose of making decisions and the future forms of land use development.	Spatial planning in coastal risk assessment will consider the coastal erzoziune
OS15	Review and, if necessary, develop recommendations for strengthening the institutional arrangements.	Analysis from the institutional and legal framework and evaluating them
OS16	Consultancy support managers considering applications and the EIA documentation on other development projects in the sea.	In coastal planning will be taken into account all existing development projects and / or proposed
IV. ECONOMIC AND FINANCIAL OBJECTIVES		

OS17	Expenditures necessary to provide estimates for coastal erosion risk management	Developing Cost-Benefit Analysis indicating the utility investment for short-term program measures
		Demonstrating the economic benefits (including social and environmental) of qualitative long-term Master Plan proposed
		Providing the necessary support to the EC request for short-term financing.
OS18	Configuring prioritized work program, based on constraints related urgent funding and program requirements.	Structuring Master Plan short-term (up to 2013), medium (2014-2021) and long (2022-2041), in conjunction with OS 4

To achieve the main objectives set forth, Master Plan proposes the development of structural measures in the coastal distribution and their correlation with unstructural measures which are designed to minimize the negative environmental impacts. Environmental Assessment Strategy implies the analisys of the objectives of the plan in terms of potential conflicts that may occure to achive them.

1.3. Existing legal framework. The relationship with other plans and similar programs:

In the EU, the main instrument for promoting integrated management of coastal areas is the European Parliament and Council Recommendation on the implementation of integrated management of coastal areas in Europe (2002/413/EC, OJ L 148, 06.06.2002). Chapter I of this recommendation emphasizes the importance of strategic approach to coastal management, based,throught others, on the recognition of threats caused by climate change and the risks caused by rising sea levels and increased frequency and violence of the storm, take appropriate measures to human settlements in coastal protection and cultural heritage, and by improving coordination between actions taken by authorities in the area of sea to land interaction. These activities contribute also to an integrated coastal zone management, which is a component of the EU's integrated maritime policy.

Nationally, the normative laws which constitute the legal framework for the development and support of implementation of this Master Plan, as one of the tools to implement an integrated coastal zone management, are represented mainly by :

- Law no. 280 of 24th June 2003 approving Government Emergency Ordinance. 202/2002 on integrated coastal zone management,
- GD 546/2004 for approving the Methodology to delimit the public domain in the coastal zone,
- GD 749/2004 on the establishment of responsibilities, criteria and methods for determining the strip of land located near the coastal zone, environmental conditions for the conservation and landscape and heritage value of areas close to the shore,

- Government Decision no. 1015 / 25th June 2004 on the approval of the organization and functioning of the National Committee of the Coastal Zone. National Coastal Zone Management Committee has the following responsibilities:
    - The approval of the plans for integrated coastal zone management and local and regional spatial planning
    - Approval of environmental impact studies of activities with important impact in coastal areas and environmental audit for the existing
    - Approval of the plans for establishing the parks and the natural reserves,
    - It is empowered by the Permanent Technical Secretaryt, to inform the competent organizations on critical situations in the coastal zone, which need rehabilitation and initiate specific projects.

PROJECT / PLAN / PROGRAM	RELATIONSHIP WITH MASTER PLAN AND PROTECTION COASTAL ZONE
"Institutional Strengthening for the implementation of the Water Framework Directive and EU Recommendation on Integrated Coastal Zone along the Romanian Black Sea coast" - MAT05/RM/9/3 Project (2005-2008) [1]	Draft of the National Strategy for Integrated Coastal Zone Management of Romania
Study on the southern shore protection and rehabilitation of the Romanian Black Sea in Romania, JICA, (2005 - 2007) [2]	Support for the development of this Master Plan Plan on the protection and rehabilitation of the Romanian Black Sea South Littoral aims the *stop of coastal erosion and increased value through new use of coastal beach areas.* *S* tudy conducted by JICA has as **main objectives:** -Formulating a plan for coastal protection in 2020 and future Achieving a vision-priority projects (feasibility studies for areas that will initiate the first project) The additional objectives: a) Elucidation of technical problems and management for the protection and rehabilitation of the Romanian Black Sea. b) Quantification of the benefit obtained from the shoreline protection measures, taking into account environmental conservation, tourism and economic activities in the coastal area for its sustainable

	management. Priority projects defined as follows: 2007 -2010: Mamaia, Eforie North (part); 2011-2015: Mamaia center (part), Tomis Nord, Eforie Center; 2016-2020: Mamaia center (part), Tomis Center, North Eforie (part), Eforie Rehabilitation plan includes the following projects: North 1.Mamaia: submerged dams 2.Mamaia South Beach sanding and rehabilitation of structures detached from the shore break-wave 3.Mamaia Center: rehabilitation of four break-wave structures detached from the shore and a submerged dike 4.Tomis North, Central and South sanding of the beach, long dikes and artificial reefs North 5.Eforie: sanding of the beach, long pier 6.Eforie center: sanding of the beach, long dikes and artificial reefs 7.Eforie South sanding of the beach, long dikes and artificial reefs 8.Olimp - Venus: sanding of the beach, long dikes and artificial reefs 9.Saturn - Mangalia: sanding of the beach, long dams and artificial reefs
Strategic Action Plan for the rehabilitation and protection of the Black Sea (BSSAP) - a document adopted at the Conference of Ministers of Environment of Black Sea countries, Sofia, 2009 [3]	The Strategic Action Plan is based on the Strategic Plan signed in 1996 (updated in 2002) and reorganized priorities and actions by considering progress in the region and the current state of national and regional environment. This plan describes the actions needed to solve major environmental problems of the Black Sea and includes a series of measures to be taken by countries bordering the Black Sea, in the context of three approaches cemor key framework for environmental management in the Black Sea region, namely: integrated management coastal zone ecosystems approach to integrated management of river basins.

Spatial Plan Area Black Sea coastal area, 2010 - approach	Planning, through its integrated nature, aimed at a strategic perspective and **objects** that track the progress / development of the region in line with available resources, in order to reduce restrictive factors and maximizing strengths, pursuing sustainable development.
Urban Area Plan - Coastal Zone, the southern - (Cape Midia - Vama Veche), 2011	Urban Area Plan is targeted strategic reconfiguration of the area defined as a subject and regulation, the state public domain, as seaside landscape specifically to play him in a re-personalized, Romanian and international tourism. The location of this PUZ (limit of approx. 200 m to dry) overlaps the area of interest to Master Plan (southern unit). **The main objectives** in developing targeted PUZ - site are: • Assimilation through a practical approach to urban planning and design located the "Integrated Coastal Zone Management"; • Making a realistic documentation will also expressing the development and control; • Customizing / repersonalizarea defined space, beaches and cliffs mainly by controlling the scale, silhouette, functionality, environment; • Harmonization of zonal planning visions from the territorial-administrative units in order to revalue geographical trumps, climatic and morphological Romanian seaside (running almost continuous strip of land elevation due to a homogeneity of relief, total exposure to the east, the sea without flux and reflux, a progressive increase in sea depth at banks, etc.). • Customizing sequential space and creating landmark elements; • Creating appropriate tools (GIS) for implementation and management (planning and control) of the town and country planning documentation; • Initiate programs and improving actions, regeneration and development at the RCP, "articulated" development programs for PUG-sized administrative units in that area, with estimates of costs and benefits in perspective; • Documenting compliance with the spirit of participatory dimension of the process; • Creating the tools and the environmental control.

CHAPTER 2. Relevant aspects of the current state of the environment and its evolution without implementation the Master Plan

Starting from the general objective of the Master Plan for rehabilitation and reducing coastal erosion risk in Romania, to protect and improve the environment and living standards of local communities along the Romanian Black Sea coast and encrease safety in the South coast, severely threatened by the destructive effects of coastal erosion in the analysis of relevant issues, geomorphological evolution of the beach comes first. In direct interdependence with it, water and biodiversity are also two environmental factors in determining weight oportunity implementation of this plan

2.1 The Ground

2.1.1.The Romanian seaside beach geomorphology

Romanian coastline shoreline behavior today is the product of energy applied to the coast due to waves and wind action. In simple terms, the answer on the coast depends on the level at which energy is applied, the magnitude of that energy and that energy resistance, due to geological structure of the coast or artificial structures. All these factors vary in space and time and therefore change occurs on various scales coast space.

Following analysis of Coastal Dynamics Report and Diagnosis of the Coastal Zone Report, prepared by Halcrow report is about the following.

Based upon the information provided in these various reports, the following text provides a summary of the main historical shoreline changes that have taken place along this shoreline.

First the Northern Unit is discussed, and then the Southern Unit. The Northern Unit is a deltaic shoreline, with a length of 93km, and has been mainly eroding for the last five decades. Retreating sectors represents (55.6%) of the shoreline, whereas advancing and stable sectors extend for ~48 km (29.6%) and ~24 km (14.8%) along the shoreline, respectively. The River Danube is the main source of sediment for the littoral drift system alongthe Northern Unit. The Danube River and its main tributaries have been damned at numerous locations – including the Iron Gates dams (Iron Gates I in 1970 and Iron Gates II in 1983). As a result of these man-made changes to the Danube catchment and delta, the sand supply to the beaches by the river dropped significantly. The actual sediment load brought by the Danube into the Black Sea is less than 40 million t/y, of which only 10-12% or less is sandy material and the rest fines, which is a source of sediment in the littoral budget of the delta front zone. The varying historic rates of change between 1989 and 2006 along the Sulina to Sf. Gheorghe frontage are shown in Figure 2.1.1.1. and along the Ciotic to Port Midia in Fig.2.1.1.2.

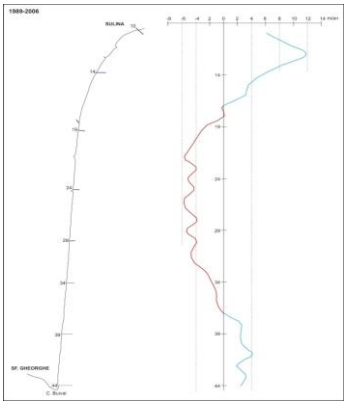


Figure .2.1.1.1 Diagrams of erosion and acretie: Sulina - St. George

The coastline of Southern Unity, dominated by cliffs, between Cape Midia and Vama Veche, was very strong influenced by anthropogenic intervention. The existence of many dams built since 1980, leading to fluctuations in shoreline position, because those structures determined by acretie formation of localized accumulations, observed in previous periods. Changing major sediment drift along the coast was caused by port development Constanta, Midia and Mangalia.

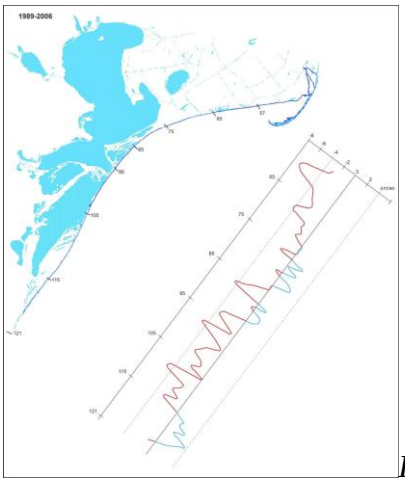


Fig 2.1.1.2.Diagrams of erosion and acretie: Ciotic-Capul Media

Since 1980 there has been an increase in rates of erosion, compared with previous periods. The only sector characterized by acretie is Midia, though even here rates were slightly lower since 1980 (about 2m/year).

Power projects in the southern beaches of the barrier was effective only for short periods of time. Erosion was more pronounced in northern and central barrier after the 1980 (values over 2m/year). Slightly lower erosion rates (less than 2 m / year) were recorded on shore resort Neptun. The highest erosion rates are registered in the Mangalia, large dam south of VI-J-23, with rates of over 4 m / year.

Vama Veche - May 2 Coast was a acretie line, however, during 1960-1980, following the southern breakwater of the port of Mangalia effect on sediment input, this section of coast has become one of erosion rates erosion of about 3 - 4m/year.

.

The main factors that caused increased erosion starting the year 1980 are:

• The frequency and variability, on decade scale of marine storms, the number and intensity of the storms being higher during 1970 -1980 but decreased since then. This explains the lower rates of erosion on the delta coast

. • Reduce intake of sediment due to construction of dams in the Danube Basin. Hydro executed on the Danube and its tributaries, ie approx. 40 dams on the mainstream of the Danube led to decrease by approx. 50% of the amount of silt carried by the river with sediment balance negative consequences of coastal beaches.

• Coastal structures caused erosion in the direction of travel coast (Sulina coast - St. George suffers from erosion due to dam Sulina) and an acretie phenomenon in the opposite direction of the coastal drift.

Data analysis results to determine erosion rates multiannual, detailed in Table 2.1.1.

Cell	**Sub-sectors**	**Change coast 1979-2006 (m / year)** **Mean values + acretie values - means erosion**
Delta jetelele the keel up to Sulina	**Laguna Musura**	**10.4**
Jetelele from Sulina to Zatoane (N1)	**Sulina**	**8.1**
	Channel probe	- 9.4
	ADR Vadan	- 6.3
	St. George	3.7
	Sakhalin	- 17.7
	Delta St. George Secondary until La Ciotat	
	Stump to Zatoane	
Delta jetelele the keel up to Sulina	Laguna Musura	10.4
Jetelele from Sulina to Zatoane (N1)	Sulina	8.1
	Channel probe	- 9.4
	ADR Vadan	- 6.3
	St. George	3.7
	Sakhalin	- 17.7
	Delta St. George Secondary until	

	La Ciotat		
	Stump to Zatoane		
Zatoane to the Port of Midia (N2)	Perisor		- 2.7
	Periteasca		0.7
	Gate		- 3.9
	Periboina		- 3.5
	Chituc		- 1.5
	Corbu (Cape Midia)	Cape Midia - North	2.1
		Cape Midia - South	3.2

Cell	**Sub-sectors**	**Shoreline Change 1979-2006 (m / year)** **+ ve values mean acretie,** **ve values mean erosion**
Midia - Constanta	North Navodari	0.15
	South Navodari	0.23
	North Mamaia	-0.79
	Central Mamaia	-1.38
	South Mamaia	-1.21
	Tomis Nord	3.12
	South Tomi	1.42
Eforie - Cape Tuzla	North Eforie	1.17 (Managed artificial - inadequate natural coastal dynamics for trend analysis)
	Central Eforie	-0.52
	South Eforie	0.78 Managed artificial - inadequate natural coastal dynamics for trend analysis)
	North Tuzla	-0.38
Cape Tuzla - Mangalia	South Tuzla	-0.29
	Costinesti	-1.11
	23 August	-0.92
	Olympus - Venus	Managed -0.37 artificial - inadequate natural coastal dynamics for trend analysis)
	Venus - Saturn (wet lands Mangalia)	Managed -2.12 artificial - inadequate natural coastal dynamics for trend analysis)
	Saturn - Mangalia	Managed -1.49 artificial - inadequate natural coastal dynamics for trend analysis)
2 Mai - Vama	May 2	-2.24

Veche	Limanu	-1.75
	Vama Veche	-1.19

Table 2.1.1. Multi-annual rates of erosion

The result of this evaluation suggested that the Northern Unit of the Romanian coast (between Cape Midia Sulina) is not considered a priority in terms of risk of erosion and the coastline is generally natural.A significant part of the alignment ensure environmental protection and therefore allows natural processes to continue assuming it is preferable to complex planning work. Location only expected to be a priority in terms of recovery work is represented by the central coast, between the Sulina and St. Gheorghe, where erosion is due to human impact on the supply of sediment from the Danube. It is possible to bring the material dredged during maintenance Sulina bar at a location near the coast, to enable the system to return to a more natural, by restoring a connection over coastal Sulina mouth.

Unlike the northern unit, the Southern union (between Port Midia and Vama Veche) presents several critical points of erosion, where most of the alignment is currently protected artificially. Many of these protective elements are in poor condition and the beaches are now eroding. At this point, the key hot spots are the beaches of Mamaia, Tomis Nord, Eforie, Costinesti, Olimp - Venus, Mangalia Pond and Saturn (Table 2.1.3.)

2.1.2 Sediments: characteristics and sediment transport

2.1.2.1 Characteristics of sediment

Beach sediments of the Danube Delta between Sulina and Zatoane are represented mainly by silt brought by the Danube in coastal area and redistributed by waves and longitudinal current shore. Most sediments are terigene and consist mainly of quartz, with secondary contributions of heavy minerals. Zatoane - Cap Midia alignament is characterized by the presence of higher proportions of shells of shellfish (up to 50%), compared to the beaches of the north and the secondary Delta Chilia. These create coarser beaches, but with less dense sediment and by the much more flat, which means they are more easily mobilized by waves.

Sediments that make up the Southern Unit of the Romanian seaside beaches come from various sources, depending on the different cell layers. Cell sedimentary between Midia and Constanta was previously powered by longitudinal transport through the alluvial Danube before Midia port expansion dams in 1980. Over the last three decades, namely since the source of sediment that was blocked by dams in Midia, the role of shell fragments of mollusks increased significantly , as a source of beach sediment.

In over 20 years ago artificial alimentation was made in the Mamaia South with sediments from Lake Siutghiol. Unfortunately, instead of using fine sand, similar to those existing naturally on the beach, the fine sand and silt were dredged in the lake and pumped on the beach. Sediment used for food was so inadequate to improve the beach and was quickly washed offshore. The three coastal cells from the south of Constanta are not supplied by the delta and here the sediments are almost entirely calcareous. These beaches are composed mainly of shells of mollusks and, to a lesser extent, of fragments of limestone from outcrops on the seafloor. There are also present, lower volumes of terigene sands, which were most likely transported there during the Late Holocene valleys active at that time (Techirghiol, Mangalia, etc..) and redistributed on the coast by currents and waves. The main feature of this Souther unit is the limestone almost coastal sediments source. Carbonate granules have a lower specific gravity (about 2.4 g / cm ^{3,} compared with weight of 2.7 g / cm ^{3} terigene granules). In addition, the granules from the shells tend to be flatter than terigene granules. This explains the particular distribution of sedimentation along the transverse profiles and their behavior. Another general feature of cells between Agigea and Vama Veche is required by this submerged limestone platform of Neogen Superior, with an irregular topography. This is generally covered with a thin layer of sand, but the distribution of unconsolidated sediments on the surface is very irregular limestone platform. Table 2.1.2.1.1 shows the average diameter of sediment present along the northern and southern units (no data available for Delta Chilia):

Table 2.1.2.1.1 Average values representative of typical sediment

Cell sedimentary	**Sectors**	**Beach sediment**	**Submerged coastal sediments**
		Average grain diameter **D50 (mm)**	
Northern Unit			
Sulina Zatoane	Sulina - Sakhalin	0.16	0.10
Zatoane - Cape Midia	Perishable and Periteasca	0.13	0.11
	Gates and Periboina	0.22	
	Chituc	0.52 (includes a significant part of fragments of shells)	
	North of Midia	0.20	
Southern Unit			
Mamaia Bay		0.22	0.17
Constanta		0.21	
Eforie - Cape Tuzla		0.41	

Cape Tuzla - Mangalia		0.48	0.17
2 Mai - Vama Veche	May 2	0.58	0.15
	Vama Veche		0.26

2.1.2.2 Sources sedimentation

Sediments and sedimentary sources of the Romanian seaside, analyzed and presented in detail by Halcrow Report Diagnosis of the Coastal Zone and Coastal Dynamics Report will be presented further conclusive.North Unit, between Chile and Midia Port is made up of beaches consist mainly of silt brought by the Danube. Along the sections of coastal erosion, there is a process of remodeling of the remains sediment bars that were part of the Delta and are redistributed by waves and currents. Danube Delta is the key source of beach sediment around the North Unit. Various human interventions in the Delta have reduced sediments in time but, despite this reduction, it remains the major source.

The influence of Danube is significantly reduce in the South of Midia, due to both natural and anthropogenic factors and especially due to dam construction Midia Port. Therefore, although the contribution of sediment from the Danube is a major element contributing to the formation of coastal area, sediment from this source tend to remain in the area north of the coast. After construction of the Port Midia long dam, sediments are not transported to the south of the entrance of Port Midia and do not pass to reach the Mamaia Golf.

The sedimentary shore sources deposits tend to come from the remodeling of existing shore, for example, remaining of coastal dunes bar found along the Danube Delta or the remains of beaches in Southern unit. Unit southern cliffs erosion is not a significant contribution to adjacent beaches. Soft material which is composed of loess layer is too thin and therefore tends to be washed offshore, while the bedrock layer is highly resistant to stronger wave action and generate sediment (mainly gravel and boulders and rare sand) in very low volumes and over long periods of time.

There is a sedimentary contribution from Ukrainian coast in the north of the Romanian seaside, along the island at the mouth of the Chilia arm Stari Istanbul, in Musura Bay. This island was formed in the '70s and '80s and continued to advance towards the south, constantly feeding the Romanian littoral cell sediment from the northern extremity (Stan et al., 2007). In the south coast there is a potential sediment transport to Bulgaria but given the nature of the sediment balance of the poor majority of the Black Sea coast, most likely result in only limited volumes of sediment from coastal area of Romania will be lost in this manner.

Another source of sediment is represented by fragments of shells of mollusks, which are found both in northern Unit (mainly south Meatball) and in Southern Unit. The contribution of this source to balance

the sediments increases from north to south. The contribution of shellfish colonies at the beach sediment balance was still very little studied. However, in southern Unitatatea over 98% of sediments are of limestone, which proves their biogenic origin (JICA Study, 2006).

Danube River Sediments

The Danube itself is the key supplier of contemporary sediments to the coastal zone, where the sediments are redistributed by the coastal currents and waves. The Danube Delta discharges into the Black Sea through three main branches: Chilia (Kilia), Sulina and Sf. Gheorghe. The majority of the water and sediment discharge from the Danube is transported through the Chilia branch, which is resulting in progradation of the Chilia secondary delta, located over the border in the Ukraine. It has been estimated that approximately 19% and 23% of the water and sediment discharge is through the Sulina and Sf. Gheorghe branches, respectively (Bondar and Panin, 2001). As the Sulina jetties block the longshore transport of sediments from the North, no further sediments arriving to the Romanian Northern Sector originate from the Ukrainian coastline or rivers (Dniestr and Dniepr). Any sediment from the Danube to the Romanian coast tends to be fine sediment distributed within the Northern Unit, and the southern section of the Southern Unit, from Constanta South to Vama Veche is entirely outside of the influence of the Danube sediments. There is little riverine input to the Southern Unit; there is only one waterway from the Danube, which enters the sea at Constanta Harbour and a very short freshwater valley, in Mangalia, which again ends in the Harbour.

2.1.2.3 Sediment Transport

There is a general north to south potential transport of littoral sediments, driven by wave transport and currents. In places, there are localised drift reversals, as a result of the nearshore bathymetry, coastal orientation relative to the prevailing waves or coastal structures. Along the Southern Unit, various coastal structures have had a significant impact on sediment circulation and have resulted in the coast becoming segmented into a number of smaller sediment cells. The rate of potential sediment transport also varies considerably over time, due to the seasonal and interannual variability of winds and waves (see the Shoreline Modelling Report, Volume 4).
Other man-made structures (see section 2.8) have further reduced longshore drift, thus separating the coast in a series of smaller scale littoral sedimentary cells:

- Sulina jetties (Chilia and Sulina sediment cells)
- Midia Harbour (Zaton – Midia and Midia – Constanta sediment cells)
- Constanta Harbour (Cell Midia – Constanta and Cell Eforie – Cape Tuzla)
- Mangalia Port (Cell Cape Tuzla – Mangalia and Cell 2Mai – Vama Veche).

There is little or no sediment transfer between these cells, and therefore the southern littoral zone relies on locally-derived sources of sediment. There is, however, little contemporary source of beach building sediment from either the cliffs or rivers, particularly in the southern unit, and the only source is reworking of the existing beach deposits, which are then simply redistributed locally. There is also evidence for a net loss offshore of sediment, during storms, which does not appear to be replenished fully during the intervening periods of milder wave conditions. The entire Southern Unit can therefore be considered as 'sediment-starved'. The loss of sediments offshore is difficult to quantify, although this process is believed to be active at locations where long jetties have been constructed. Elsewhere, it is likely that finer sediment released from the Danube and from erosion of the loess cliffs will be washed offshore. Along the Southern Unit, a net offshore loss of sands seems to be occurring, with sediments being moved offshore during storms. Along this section, it is also possible that some sand accumulated within depressions in the limestone surface that outcrops directly on the sea bottom along extensive parts from Eforie to Vama Veche

A modeling study shoreline (shoreline Modeling Report, Halcrow, 2011) was performed using data on winds and waves for the period 1992-2010 to assist in understanding the long-term changes in shoreline changes caused by littoral drift and short-term changes in beach profile due to the transverse transport. Coastal transport modeling indicates that the net longitudinal sediment transport direction is generally oriented to the south along the Romanian coast, except:

- The shoreline stretches which are south of the largest coastal structures (Sulina jetty, Midia Harbour and Constanta harbour), where the influence of the structures has led to partial sheltering of the shoreline from wave energy from the north to northeast sector.
- The embayment south of the Sahalin Islands.. Here the indented nature form of the shoreline has led to partial sheltering of the shoreline from wave energy from the north to north-east sector. The southerly transport immediately south of the Sahalin spit is due to a change in beach orientation at this location.

The change in the direction of the net longshore transport results in sediment transport divergence zones and the consequent potential for shoreline erosion. Furthermore, south of the limit of the effect of wave sheltering by the structures or shoreline indentation, the northerly wave energy generally increases, leading to increasing southerly longshore transport and consequent potential for shoreline erosion.

2.1.2.4. Sedimentary sources for sanding artificial beaches

Coastal zone diagnostic report, Halcrow, 2011, evaluated the available sediment sources for sanding artificial beaches, its conclusions being explained as follows:

-The Cochirleni zone (km 310 – km 305 on the Danube River) is proposed as a potential source for the nourishment of the Mamaia-south and Eforie Northbeaches.

• It should be noted that the Danubian alluvia from the Calarasi zone (km 390 –km 375) are coarser-grained and could be more adequate for the Eforie North beach, but due to the longer transport distance the costs would be higher than for the Cochirleni sand.

• The Aptian sand mined in the Cuza Voda and Tibrinu quarries is considered an auxiliary source, with grain-size similar to the Mamaia beach sand; pointing out its higher silt and clay content (25 – 35%).

• The biotic quality of the Danube River Calarasi – Cernavoda sand is characterised by the absence of the pathogenic bacteria and parasites, as confirmed by the Constanta State Sanitary Inspection Laboratory.

• The sand delivery capacity of the Danubian River sand mining companies is important. Several economic agents could supply together over 100,000 tones of sand per month. The same capacity is declared by the Cuza Voda and Tibrinu mining operator.

• The sand dredged by AFDJ Galati from the Sulina distributary mouth produces large volumes, significant for sedimentary stock of the eroded Sulina Sfantu Gheorghe beaches.

Future shoreline changes were expected – in the Diagnosis of the Coastal Zone, Halcrow, 2011, using projected rates of erosion on a Master Plan related evaluation period of thirty (30) years. In addition, erosion projections take into account also a period of 50 years. In Table 2.1.3. the results of risk estimates for sub-coastal erosion in southern unit, in the situation of human non-intervention to mitigate coastal erosion.

Erosion rates presented in this diagnosis report of the coastal zone are preliminary and are included to evaluate its status and evolution of the coastal zone in case you do not intervene. A more detailed assessment is recommended in subsequent phases of implementation of the Master Plan proposed solutions

Major Coastal Unit	Coastal Sediment Cell	Sub sector	Approximate current erosion rate (m/year)	Defence effective residual life (years)	Predicted erosion under No Intervention over 30-50 years (m range)	Assumptions (All estimates include allowance for sea level rise)
South	Mamaia Bay – Cape Midia to ConstantHarbour	Navodari North	0.15	N/A	Accretion	Recent trends continue.
		Navodari South	0.15	N/A	Accretion	Recent trends continue.

Major Coastal Unit	Coastal Sediment Cell	Sub sector	Approximate current erosion rate (m/year)	Defence effective residual life (years)	Predicted erosion under No Intervention over 30-50 years (m range)	Assumptions (All estimates include allowance for sea level rise)
		Mamaia North	1 to -1	N/A	30 – 50	Recent trends continue.
		Mamaia Centre	0 to -1.5	<5	80 – 110	Residual life of defences <5yrs Accelerated erosion following defence failure
		Mamaia South	Artificially managed (not suitable for natural coastal dynamics trends analysis)	<5	150 – 170	Residual life of defences <5yrs Accelerated erosion following defence failure
		Tomis North	Artificially managed (not suitable for natural coastal dynamics trends analysis)	<5	120 – 160	Residual life of defences <5yrs. Accelerated erosion of reclaimed land following defence failure. Additional allowance for cliff safety zone.
		Tomis South	Artificially managed (not suitable for natural coastal dynamics trends analysis)	Coastal defences <10 Tomis Port <20 Tomis Port to Constanta Port <10	40 – 60	Residual life of defences <10yrs. Accelerated erosion of reclaimed land following defence failure. Additional allowance for cliff safety zone.

Major Coastal Unit	Coastal Sediment Cell	Sub sector	Approximate current erosion rate (m/year)	Defence effective residual life (years)	Predicted erosion under No Intervention over 30-50 years (m range)	Assumptions (All estimates include allowance for sea level rise)
		Port of Constanta	N/A	>30	N/A	Port breakwaters remain effective beyond Master Plan evaluation period
	Eforie – Cape Tuzla	Eforie Nord	Artificially managed (not suitable for natural coastal dynamics trends analysis)	Defences <5 Marina >30	60 – 80	Residual life of defences <5yrs. Accelerated erosion of reclaimed land following defence failure. Additional allowance for cliff safety zone. Assumed erosion rate of -1m/yr post defence failure.
		Eforie Middle	-1 to -3	existing <5 new >15-20	40 – 60	Residual life of defences <5yrs. Accelerated erosion following defence failure.
		Eforie South	-1	<5	60 – 80	Residual life of defences <5yrs. Accelerated erosion of reclaimed land following defence failure. Additional allowance for cliff safety zone. Assumed erosion rate of -1m/yr post defence failure.
		Tuzla North	0 to -3	<10	20 – 30	Assume recent toe protection delays erosion for less than 10yrs. Additional allowance for cliff safety zone.

Major Coastal Unit	Coastal Sediment Cell	Sub sector	Approximate current erosion rate (m/year)	Defence effective residual life (years)	Predicted erosion under No Intervention over 30-50 years (m range)	Assumptions (All estimates include allowance for sea level rise)
	Cape Tuzla - Mangalia	Tuzla South	0 to -3	<10	20 – 30	Assume recent toe protection delays erosion for less than 10yrs.Additional allowance for cliff safety zone.
		Costinesti	0 to -3	Groyne <5 years Breakwater >15 years	50 – 70	Groyne and toe protection effective for <5 yrs. Additional allowance for cliff safety zone.
		23 August	0 to -2	N/A	50 – 60	Recent trends continue.
		Olimp - Venus	Artificially managed (not suitable for natural coastal dynamics trends analysis)	<5	70 – 110	Residual life of defences <5yrs. Accelerated erosion of reclaimed land following defence failure. Additional allowance for cliff safety zone. Assumed erosion rate of -2m/yr post defence failure.
		Balta Mangalia	-1 to -3	N/A	70 – 110	Recent trends continue.
		Saturn - Mangalia	Artificially managed (not suitable for natural coastal dynamics trends analysis)	<5	70 – 110	Residual life of defences <5yrs. Accelerated erosion of reclaimed land following defence failure. Additional allowance for cliff

Major Coastal Unit	Coastal Sediment Cell	Sub sector	Approximate current erosion rate (m/year)	Defence effective residual life (years)	Predicted erosion under No Intervention over 30-50 years (m range)	Assumptions (All estimates include allowance for sea level rise)
						safety zone. Assumed erosion rate of -2m/yr post defence failure.
		Mangalia Port	N/A	>30	N/A	Port breakwaters remain effective beyond Master Plan evaluation period
	2 Mai – Cape Schabla (Bulgaria) – local national boundary at Vama Veche (state border with Bulgaria)	2 Mai	-2.2	<5	80 – 120	Residual life of defences <5yrs. Accelerated erosion of reclaimed land following defence failure. Additional allowance for cliff safety zone.
		Limanu	-1.8	N/A	70 – 110	Additional allowance for cliff safety zone.
		Vama Veche – (Vama Veche to the State border with Bulgaria)	-1.2	N/A	50 – 80	Additional allowance for cliff safety zone.

Source: Diagnosis of the coastal zone, Halcrow, June 2011

In conclusion, the scenary without intervention on the southern coast Unit in Figure 2.1.3. presents a summary of the risk of erosion.

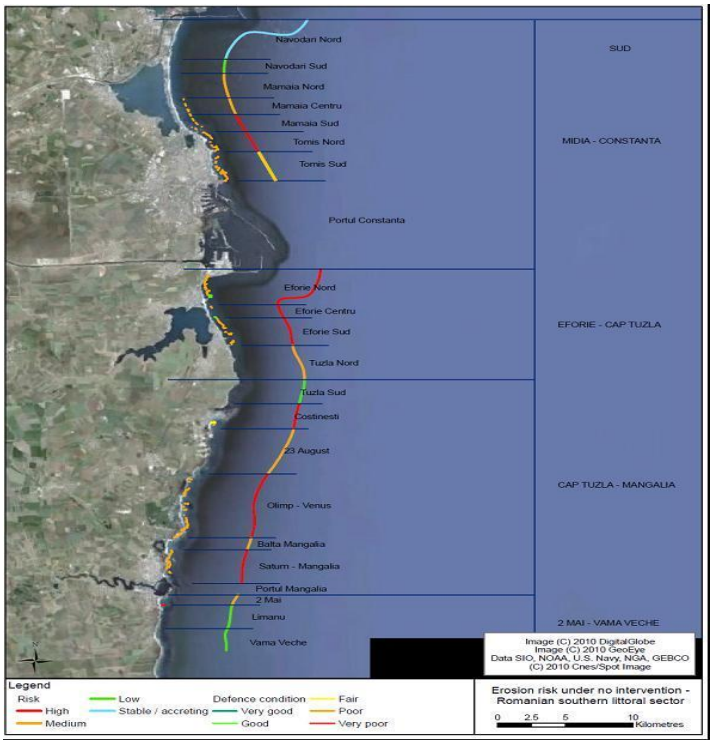


Figure 2.1.3. Presentation of the risk of erosion for southern Unit
Source: Diagnosis of the coastal zone, Halcrow, June 2011

2.2. Waters

2.2.1 Groundwater

For Dobrogea plateau area, the hydrological, hydrogeological basin characteristics are particularly influenced by excessive continental climate and a thick porous rocks, which provide fast and quartering water infiltration depth in different levels of carstification. Surface water blades almost lacking, and those of their debts based flysch are extremely low and fluctuating. Layers deep levels are found especially in confined limestone are rich waters flow, carbonated; in South Dobrogea they also have artesian character. In the coastal Mangalia, Neptun littoral are mesothermal springs. In the Delta, deep aquifers have the largest expansion being stationed in gravel and sand. The hydrochemical type varies with the degree of mineralization (which increases from west to east) from biarbonatat-sodium-calcium at chlorinated, chloride, magnesium sulfate-sodium. Dobrogea-Litoral water basin space were identified and delineated, on the basis of geological and hydrodynamic criteries, 10 groundwater bodies, of which five groundwater bodies belong to the studied coastal area of the Master Plan (fig.2.2.1.1):

• Four groundwater bodies, namely RODL01 (Tulcea), RODL02(Babadac), RODL03(Harsova-Ghindaresti) , RODL04 (Cobadin-Mangalia) and RODL08/Casimcea- are of crack – karst type, being developed in hard rocks, predominantly limestone . One of these bodies is the transbordery. (RODL04).

• A groundwater body RODL05 (Central Dobrogea) is porous and permeable type

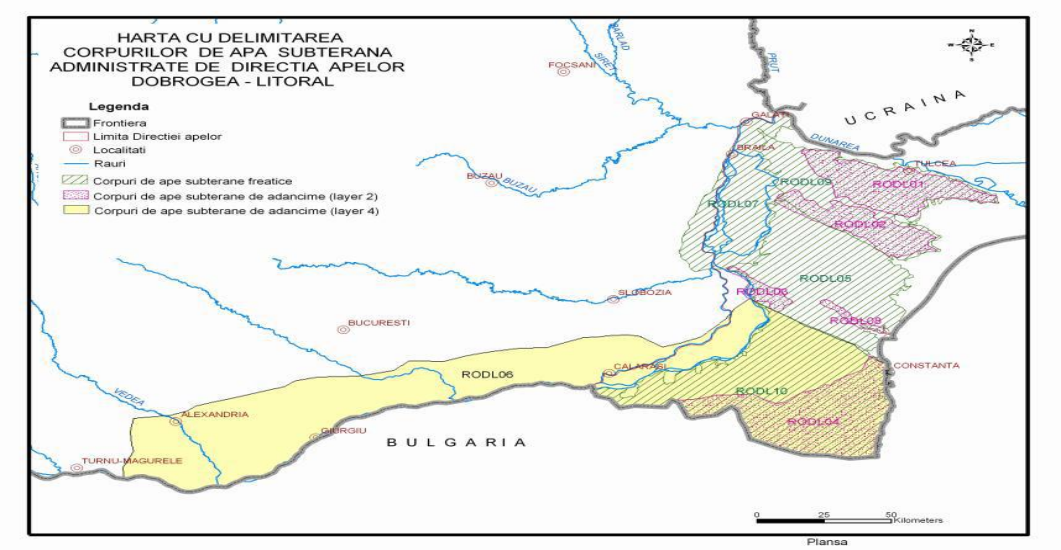


Figure 2.2.1.1: BH groundwater bodies in Bazin Dobrogea – Litoral Area

Source :Management Plan of the Danube River, Danube Delta, Dobrogea and coastal waters RIVER AREA

In 2010, following a qualitative monitoring of groundwater (from 50 wells in the Basin Area Dobrogea - Litoral), bodies of water in the area of influence of the Master Plan, namely: RODL04 Cobadin - Mangalia and RODL05 - Central Dobruja were classified as having good chemical status. Water body-Casimcea RODL08 was not monitored in 2010.

2.2.2. The surface waters

In accordance with Article 2.10 of the Water Framework Directive 2000/60/EC, the meaning of "surface water body" is a discrete and significant element of surface water such as: river, lake, channel, bad sector, sector channel, transitional waters, a part of coastal waters. The water body is the unit used to determine, to report and to verify the target of achieving the objectives of the Water Framework Directive, so that accurate delineation of these water bodies is very important.

Transitional waters are bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their geographical location near the coastal waters but which are substantially influenced by the waters of rivers Article 2 (6).
Coastal waters are surface waters contained in the area between the shoreline and a nautical mile measured from the nearest point of the baseline from which territorial waters are beginning to be measured extending where possible to limit the transitional waters . Article 2 (7).

2.2.2.1. Coastal waters

Black Sea coastal waters *are represented* by **marine transitional waters** *(Chilia Periboina*) and **coastal waters themselves** *(Periboina-Vama Veche*).
The analysis carried out for coastal waters, in accordance with the Water Framework Directive has led to the identification, by Abd-L, the following coastal water bodies:
- 2 marine transitional water bodies: Chile in Periboina, and Sinoe Lake;
- 4 coastal water bodies: Singol Periboina-Head, Singol Head - Eforie North, North Eforie -Vama Veche and Mangalia.

Of all of these, two bodies (Cap Singol - North Eforie and Mangalia) were designated heavily modified bodies and other bodies have been designated natural bodies (Management Plan of the River Danube, Danube Delta, Dobrogea River Area and coastal waters, 2009). The Romanian Black Sea coastal waters are the waters lying between the land surface and the distance of 1 nautical mile from the nearest point of the line, located between Chile and Vama Veche. Romanian coastal waters have been included in the DRBD with an area of 807,827 km2, given that the state of coastal waters is influenced by state Romanian Danube. So state the Romanian seaside coastal waters is determined by the Danube River which is the aggregate of all the pressure Danube basin, the Black Sea, bringing in annual contribution amounts poluanti.Pana important in the early 90s suffered a Black Sea significant degradation of natural resources due to anthropogenic phenomena, following the restructuring of economic activities, increased demands on environmental policies, the establishment of marine protected areas (over 71% of the length of coastline) and new regulations on the exploitation of marine resources in recent years have led , a slight but continuous process of recovery of the marine ecosystem. This trend of ecological recovery is felt both at the level of water quality parameters, and structural and functional level of systemic levels of biota.

Physico-chemical indicators used in monitoring the quality of the transitional, coastal and marine waters in the Romanian Black Sea coast area are analyzed based on evidence collected from a network of stations located between the Sulina and Vama Veche. In 2010 (Report on the state of marine and coastal environment in 2010) were analyzed a total of 210 samples from a network of 38 stations located between the Sulina and Vama Veche in oceanographic expeditions conducted in the period 6 February to September. Monitoring network is covering all water typologies Water Framework Directive included in the Marine Strategy Directive, as follows: transitional waters - 9 stations (Sulina,

9 Mile, St. George, Portia, - up to 20 m isobath inclusive), coastal waters – 18 (Gura Buhaz, East Constanta, Mamaia Casino, North Constanta, South Constanta, Eforie, Costinesti, Mangalia, Vama Veche, till including 20 m isobath) and marine waters - 11 stations (all stations on the network that are on the izobatele 30 m and 50m).
The main physical and chemical indicators and status analysis, which characterize and control the level of eutrophication are: temperature, transparency, salinity, pH, dissolved oxygen, inorganic nutrients.

General indicators

Water temperature recorded over the Romanian seaside, in the entire water column, values between 0.8 and 27.8 0C 0C (median 7.50 OC and standard deviation 8.92 OC). Minimum values were in February exclusively to the surface and the maximum in September, no matter the water body type analyzed, in accordance with temperature of the air.
In Constanta, the absolute minimum was -0.4 0 C in January, when the sea froze and the absolute maximum on the 17th of August 2010, when there were 29.8 0C. Although the average in April, June, July, August, November and December 2010 exceeded the variability characteristic of the area, mean monthly water temperature multi-period between 1959-2009 and the monthly average of 2010 differs slightly.
Transparency varied between 0.3 - 6,5 m (median 1.8 m, dev.std.2, 2 m). Maximum was recorded in May, in coastal waters, East Constanta station 2, while the minimum in transitional waters, the Sulina 10 m in March (see Table 2.2.3.1.2). In all cases, the minimum is below 2 m, the allowable amount for both the ecological status and for the impact of anthropogenic activity of the Order 161/2006 "Norms on surface water quality classification in order to establish state".
The salinity of transient, marine and coastal waters from the Romanian seaside area recorded values between 0.50 to 18.63 PSU (median standard deviation PSU16.93 and PSU 3.359). Maximum belongs to the marine waters, Sulina station 30 m (20 m), March, while the minimum of transitional waters, in the same month, Sulina station 20 m (0 m) due to the influence of intake river. There are remarkable the minimum values of coastal waters and marine areas, recorded at the surface due to the regime of the wind, rainfall and river intake influence. Multi-annual monthly averages in the period 1959-2009 and those monthly from 2010 differ slightly. Year average in 2010 is 13.94 PSU.
The Ph from the coastal waters from Constanta area recorded monthly average values ranging from 8.10 in December and 8.37 in January. In 2010, monthly average values of pH is considered to have been generally higher, tendency which do not confirm the trend of coastal water acidification.
Dissolved oxygen in the marine environment is a very important variable in assessing the functionality and behavior of representative ecosystems, especially in the fact that it can be easily measured by conventional chemical methods or electrochemical techniques. Dissolved oxygen regime and its fluctuations influencing factors are of major importance in assessing the severity of impact on marine ecosystems. Primary source of oxygen in the marine environment is the gas exchange at air-water interface and its direct production by photosynthesis of aquatic plants, algae and bacteries photosynthetized.Strong gradients in dissolved oxygen concentrations in coastal waters may occur due

to variations in temperature, salinity, nutrient intake, batimetry , in the movement of masses of water, climatic factors and biological production.
Dissolved oxygen concentration in the waters of the Romanian Black Sea coast ranged from 69.2 mm at Mangalia 30 m (20 m), in September, and 456.9 mm, the Sulina 30 m (0m), in March (median 322.2 mm and 67.9 mm standard deviation). Annual averages are within the range 289.9 m (1998) - 374.9 m (2007), the average in 2010 being 306.8um. Low monthly averages of July and August is due to extreme situations reported in the summer of 2010. Thus, on July 29th, 2010, in Mamaia Station Casino 0 m, the dissolved oxygen concentration decreased to near anoxia (34.8 mm / 0.78 cm3 / l), although the water temperature was quite low (21 , 4 0 C), a situation that led to mortality in fish fauna.

Oxygen saturation values of transitional, coastal and marine waters in Romanian seaside remained between 29.3% -156.63% *(median 99.5%, dev.std. 16.9%),* both extrems belonging to the coastal area. As in the case of dissolved oxygen, minimum oxygen saturation values are found in summer ,in the water colum, being below the allowable limit (80%), both for ecological stream and also for impact of anthropogenic activity area by 161 / 2006 Order. The minimum value of saturation was recorded in the East Constanta 1, to 10 m depth in July. The low oxygen saturation allows the allocation of consumption of oxygen and other factors than the climates ones, such as oxidative degradation of organic matter from algae flouring.

The following conclusions can be drawn regarding the general indicators:

• The year average temperature of sea water at Constanta increased significantly over the past eight years from 1959 to 2002 period.

• The median values of transparency of the sea increase from transitional water to marine waters waters, but lower than in 2009.

• Salinity is influenced by the river intake and by climatic factors (especially wind and precipitation regime) and in 2010 recorded insignificant differences from the 1959-2009 multi-annual monthly averages, although it is the year with the lowest average annual value (13.94 PSU) in the last 19 years.

• pH recorded in 2010 higher values than in the period 1998-2009, especially in winter.

• Monthly average values of dissolved oxygen in sea water at Constanta were framed in the specific area variation, although they were lower in July and August, when there were phenomena of hypoxia and mortality in fish fauna.

• Although it has not been met since 2001, the phenomenon of hypoxia was recovereding in the Eastern part of Constanta, due to the consumption of oxygen in the oxidative degradation process of

organic matter rezulting from flowering signal and climatic factors (air and water temperature, wind and rainfall regime).

In general, on long term, there is a slight decrease in the values of oxygen concentration dissolved in sea water at Constanta, since 2007. Thus, if in 2009 there was a maximum value of 517.2 mm in July in South Constanta 20 m (Report on status of marine and coastal environment in 2009, Gregory INCDD Antipas), in 2010 there was a maximum of 456, 9 mm in March in Sulina section 30 m..

- **Indicators of eutrophication**

Concentrations of **phosphate (PO4) 3** registered in 2010 values between the range *"undetectable"* - 6.25 mm *(median 0.25 mm, dev.std. 0.58 m),* both extrems belonging to the coastal waters. The maximum value was recorded in South Constanta station 5 m (0 m) as a consequence of the existing in South Constanta a treatment station. It is to be remarkable the month June 2010, when all measured values were below detection limit due to biological consumption of inorganic phosphorus, confirmed by the blossom from next month (July).
Total phosphorus representing the amount of organic and inorganic fractions of the phosphorus in seawater, recorded concentrations ranging from 0.15 to 8.22 mm *(median 0.84 mm, dev.std. 0.837 m),* following the same trend as the inorganic form -phosphate. Concentrations of **nitrates (NO3) from the** waters of the Romanian Black Sea coast recorded in 2010, values in the range 0.81 to 26.47 mm *(median 1.78 mm, dev.std. 4.05 mm)*
Azotitii (NO2) – intermediates forms from the redox processes in which are involved inorganic nitrogen species.; they **have** concentrations in the range of "undetectable" - 7.43 mm *(median 0.26 mm, dev.std. 1.38 m)*
Ammonium (NH4) + poliatomic ion in which the nitrogen has the maximum oxidation number, +3,it is the most easily assimilated form of inorganic nitrogen. Its concentrations in the recorded values from 0.22 to 30.66 mm *(median 2.30 mm, dev.std. 3.88 m),* except South Constanta station 5 m, in which high values were determined in September (50.58 m).
During 1980-2010, annual average concentrations of ammonium were 3.73 mm (1985) - 12.75 m (1980) *(median 6.19 mm, dev.std.2, 02μM),* the average of 2010 was 8, 27 mm, the largest in 15 years. In 2010, concentrations of ammonia nitrogen in some cases exceeded the amount permitted by Order 161/2006, 0.1 mg/dm3 (7.14 NH_4 mm).

Eutrophication indicators show that:

- In the coastal area of Constanta, the phosphate concentrations recorded values very low, comparable to those of the 60s, but with a broader seasonal variability.
- Total phosphorus recorded in generally normal values of concentrations , except for stations located in areas of influence of river input (transitional waters and marine) and

anthropogenic influence (coastal waters), the maximum values exceeded the minimum value allowed by Order 161 / 2006.

- Nitrates concentration distribution follows a gradient from low to transitional marine waters. Values recorded in 2010 in Constanta are generally lower than in previous years.
- Ammonia made both by anthropogenic sources (treatment plants and river intake) and also by the regeneration, in 2010 in Constanta, it was the dominant form of inorganic nitrogen salts.
- In 2010, by the the Romanian Black Sea coast there are generally observed two important sources of nutrients, namely: the contribution of rivers (Danube) and urban agglomerations Constanta and Mangalia, because wastewater treatment plants and ports in those areas.

Chlorophyll *a*

Chlorophyll a is one of the most common determined biochemical parameter ,being an indicator of plant biomass and primary productivity. Due to its importance in the marine ecosystem and the fact that is measured easily than phytoplankton biomass, chlorophyll a was included on the list of indicators for the "eutrophication" of the EU Water Framework Directive, representing one of impact parameters to be monitored. Chlorophyll content, in *the* shallow waters of the Romanian seaside, has in 2010 a high seasonal variability, its values being between 0.66 and 58.47 mg / l, exceeding the 2009 highs registered with 50, 63 mg / l (Report on the status of marine and coastal environment in 2009, Gregory INCDD Antipas). Seasonal distribution *of* chlorophyll showed a first maximum during the end of winter (early March), according to the annual cycle of development of diatoms during this period and recorded the maximum annual amount. After the end of the spring period, characterized by low concentrations of chlorophyll *a*, very high flow of the Danube, associated with unusually high temperatures of the surface layer of the sea, led to a significant increase in the level *of* chlorophyll in the summer, the maximum touching each other in August. Chlorophyll *a* concentrations have remained high until mid autumn, as a result of thermal favorable-haline regime. Beginning with the end of the autumn period, chlorophyll *a*'s values fell sharply in December, most values being subunit. Chlorophyll maximum values are reached when the flow *of* the Danube has recorded very high values, confirming that the thermal haline regime is the main factor responsible for seasonal and inter-annual variation of chlorophyll, while the nutrient regime, even in periods of low flow of the Danube , presents a favorable level to support a high primary productivity in waters near the shoreline.

- **Indicators of contamination**

Heavy metals. Coastal areas are complex and dynamic systems, being subject to natural or anthropic influences. Heavy metal contamination of coastal areas can be correlated directly with urban or industrial sources such as factories, power plants, port facilities, wastewater treatment plants. Influence

of the rivers upon the coastal areas is significant, constituting a major source of metals, especially in particulate form, extreme hydrological events (floods) contributed to the intensification of this contribution. Metal atmospheric flows, which demonstrate both natural and anthropogenic influences, are also considered to be of great importance for the European seas in both coastal areas and in the basin level and depend on local climatic variability and weather conditions. (JRC 58 087, EUR 24335-2010; http://europa.eu/). Heavy metal concentrations determined during the year 2010 in seawater were within the following areas of variation: 0.03 to 10.24 mg / L copper, 0.01 to 3.21 mg / L cadmium, 0.13 - 15.91 mg / L lead, 0.35 to 9.24 mg / L nickel, 0.01 to 5.21 mg / L chromium. (Report on status of marine and coastal environment in 2010, Gregory INCDD Antipas). Between bodies of water there were different concentrations of heavy metals. Thus, the annual average concentrations of these three elements were higher in transitional waters, although it should be noted that in the case of lead, the maximum values were measured in shallow coastal waters during the summer season. In relation to environmental quality standards in the field of water recommended by national and European legislation (Order 161/2006, Directive 2008/105/2008), was observed for all investigated elements as annual mean values calculated for each body of water have framed below the threshold.

- ***In the Sediments***

The distribution of concentrations of heavy metal in sediments is influenced by the contribution of the natural and anthropogenic sources and depends on the mineralogical characteristics and grain size of sediments . Heavy metal concentrations determined during the year 2010 in sediment samples were within the following areas of variation: 3.88 to 143.09 mg / g copper, 0.01 to 4.59 mg / g cadmium, 2, 95 to 122.17 g / g lead, 3.17 to 143.29 mg / g nickel, 4.66 to 158.01 mg / L chromium. (Report on status of marine and coastal environment in 2010, Gregory INCDD Antipas). In relation to marine sediment quality standards recommended by national legislation (Order 161/2006), annual average concentrations calculated for the coastal zone (0-20 m) did not exceed the recommended target values. For sediments from transitional and marine areas, with a higher capacity to accumulate heavy metals, given their predominantly finer texture (bank, clay, silturi) and a higher content of organic substances, there were registred annual averages of Cu, Cd and Ni,that have slightly exceeded the recommended quality standards.

- ***Marine organisms***

Bioaccumulation of heavy metals in mussel tissue full *(Mytilus galloprovincialis)* from the Romanian coast, analyzed in 2010, was characterized by values that are written generally in the fields observed in the last 5 years (especially for copper and nickel), with a slight reduction peaks for cadmium and lead, joined in the values of maximum allowable concentrations of toxic heavy metals in shellfish meat (1 microgram / g SP Cd, 1.5 mg / g Pb sp) recommended by the European legislation (EC no. 1881/2006, as amended by EC no. 629/2008).

- **Total petroleum hydrocarbons**

The average value of oil pollutant in water was 108.1 mg / l, between the limits of variation of 17.5 mg / L and 651.65 mg / l. Mean values were determined low (<200 mg / l) of the total content in oil hydrocarbons - HPT in all bodies of water compared to the period 2006-2009. In 2010, the mean low stands of coastal waters - 55.0 mg / l. The maximum value was recorded in marine waters - Sulina station 30 m,in March, probably due to accidental oil spills. It follows that the medium total petroleum hydrocarbon content of marine waters, transitional and coastal concentrations do not exceed 200 mg / l, in 2010 continue the trend of decreasing petroleum hydrocarbons recorded in the last period (2006-2009) in environmental components investigated (average value for the year 2009: 238.5 g / l, compared with 2010: 108.1 g / l).

- **Polynuclear aromatic hydrocarbons - PAH**

Polyaromatic hydrocarbons are constituents of a wide range of contaminants, which differ from others through the number of benzene cores, through their position in molecular structure, through the nature and position of the molecule substitutes.The monitoring of polynuclear aromatic hydrocarbons (PAH) conducted in 2010 by analyzing water and sediment samples, indicates the presence of the 16 priority hazardous organic contaminants (naphthalene, acenapftilen, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo [a] anthracene, benzo [b] fluoranthene, benzo [k] fluoranthene, benzo [a] pyrene, benzo (g, h, i) perylene, dibenzo (a, h) anthracene, indeno (1,2,3-c , d) pyrene in 70% of all samples taken from the area between Sulina - Vama Veche. Polynuclear aromatic hydrocarbon total content in - ΣHAP mg / l water varies from 0.1056 to 4.4341 mg / l, with an average of 1.344 mg / l. In 2010, the concentration of polynuclear aromatic hydrocarbons in sediment samples ranged from 0.015 to 2.044 mg / g, with an average of 0.629 mg / g. Monitoring of polynuclear aromatic hydrocarbons in sediments revealed the presence of 16 PAH's in all samples. Significant concentrations of organic material for the 16 priority hazardous contaminants were recorded both in sediments collected from the northern sector (Sulina - 30 m, St. George - 20 m) and in the southern (Mangalia - 40.50 m) compared with 2009, when the highest content of polynuclear aromatic hydrocarbons was determined in samples from southern sector. *In conclusion,* in the year 2010, monitoring of polynuclear aromatic hydrocarbons in the coastal , transitional and marine waters have high values to the following compounds: anthracene, naphthalene, phenanthrene, the average values were within the limits of variation in the period 2006-2009. In sediments, the presence of the following compounds: benzo [a] pyrene, naphthalene, phenanthrene, anthracene , fluoranthene, indeno (1,2,3-c, d) pyrene, benzo (g, h, i) perylene, pyrene, benzo [a] anthracene, in significant concentrations and a constant frequency, indicats a ***high level of pollution.***

- **Organochlorine pesticides**

In 2010, organochlorine pesticides concentration (HCB, lindane, heptachlor, aldrin, dieldrin, endrin, DDE, DDD, DDT) in seawater ranged from 0.0004 to 1.807 mg / l, having an average value of 0, 2356 mg / l. There were determined low values of the total content of low-Σμg / l in all bodies of water pesticides compared to previous years. Organochlorine pesticides and concentration in sediment samples ranged from 0.0017 to 0.8355 mg / g, with an average of 0.0925 mg / g. Compared with 2006-2009, the downward trend seen in recent years. In conclusion, the tendency of decreasing organochlorine pesticides in marine waters, coastal and transitional sediments, found in the previous years.

- **Microbiological load**

Microbiological load –state indicator of contaminant in the marine environment, was, in 2010, acceptable in the bathing area, the recorded enterobacteries concentrations (total coliforms / CT, fecals, coliforms / CF, fecal streptococs/ SF) fluctuating, generally under National norms and limits set by European Community Directives and values that reflect the degree of fecal pollution of marine waters for bathing. The frequency of exceeding the permissible or recommended concentration was, in some areas of bathing, 14% for CT and CF were respectively, 21% for SF, higher values of 2009 and was mainly due to frequent use without compliance with sanitary by tourists, in particular hydro-meteorological conditions of 2010 (during the summer hot weather with high temperatures over 29 ° C, the coastal marine waters). The situation identified during the summer 2009 reflected an evolution of marine bathing water quality directly dependent on hydro-meteorological conditions in particular in the last three years (2008-2010), characterized by hot weather during summer, with very high temperatures marine waters adancime.The maximum values of bacterial analyzed indicators (> 16,000 bacteria / 100 ml) were identified, as in previous years, in areas under influence of sewage spillway, with possible negative impact on the marine environment and human health. *In conclusion,* in *marine areas* used for recreational *bathing,* there were no indicators excess of physical, chemical and microbiological quality in relation to national and community rules, falling within the categories as "good" and "very good "quality.

2.2.2.2. Littoral Lakes

Lake Corbu
Lake Corbu has a surface area of 5.2 km^2, a volume of 25 Mm^3 and a mean water depth of 1,2 m. Lake Corbu is joined to Lake Tasaul and it's banks are mostly formed from loess in the form of small cliffs.

Lake Tasaul
Lake Tasaul has a surface area of 23,35 km^2, a volume of 57 Mm^3 and a mean water depth of 2.9 m. The lake is joined to Tasaul Gargalac Lake (also known as Lake Corbu) forming a lake resort. Tasaul

Lake is a typical costal lake, but with no direct connection to the Black Sea. Its banks are in the form of cliffs, and the basin is formed mostly by river Casimcea.

Lake Siutghiol

Lake Siutghiol is a freshwater lake with a surface area of 19 km^2, a volume of 88 Mm^3 and a mean water depth of 2.5 m. Lake Siutghiol and Lake Tabacarie are located north of Constanta, forming a complex lake due to the close bond between them.

Except for the eastern part, bordered by a 300-600m barrier beach at Mamaia resort, Lake Siutghiol has a wall with heights ranging between 10 and 20m. Due to the exposure of the northeast winds the west coast and the southern lake is subject to direct wind abrasion. In the more sheltered north, reed vegetation has established.

Lake Tabacarie

Lacated in the northeast of South Dobrogea, close to the geological contact with Central Dobrogea (Capidava Ovidiu Fault), in the northern part Constanta municipality, tabacarie lake covers an area of about 99ha. The lake is placed in an elongated depression area, its formation taking place due to the damming of a river valley. Genetically speaking, this lake is classed as a river marine firth. In terms of sedimentology, the Tabacarie lake area is linked to the evolution of Siutghiol lake, located to the north, but also the erosion processes of basin shores in which it was formed. The lake shores are entirely man built. The west shore reaches the 6-7 m contours. To the east and south, contours are lower, at 2 -4 m. On the northern side, the shore is very low (1 – 2 m).

Lake Techirghiol

Lake Techirghiol has a surface area of 12.27 km^2, a volume of 42 Mm^3, a volume of 42 Mm^3 and a mean water depth of 3m and has a limited source of freshwater. The 2.2 km sandy barrier beach between North Eforie and South Eforie separates Techirghiol Lake (to the West) from the sea (to the East). Two dams constructed in 1983 and 1989 divide the lake into three parts, resulting in three different areas: an area with freshwater in the West (1.0 – 2.3 g/l salinity), brackish water in the Central area (6-8 g/l salinity), and a saltwater lake located near the Black Sea (52 – 55g/l salinity). Teghirghiol lake is hypersaline, with a water level that fluctuated over the years due to changing ground water levels. As a resul of this, a drainage system discharging into the sea has been constructed. The salt lakes of Teghirghiol are of special interest with their significant of gyttja, a mud rich in organics which has valuable therapeutic qualities.

Lake Costinesti

Lake Costinesti was historically a shallow water bay that has progressively transformed into a lagoon by the longshore current action, which has lead to the creation of a littoral barrier. The catchment area is the smallest of the entire Romanian sea cliff coast, being just 21.25 km^2 (Ariadna Breier, 1976). The lake was previously cut – off from the sea, however in 2005 a heavy rainfall and storm event resulted

in a breach in the barrier, and an inlet forming through to the lake. The breach channel has now been armoured changing in form a freshwater to saline/brackish lake. In order to prevent wave penetration into the lake via the link channel, where the lake flows into the sea, two dikes/brakwaters have been built, resulting in a small port area. The now artificial channel from the lake may be allowing a change in salinity to occur in the lake, as would occur under a long term natural breach of the barrier. As salinity increases in the lake is a risk of saltwater intrusion into the aquifer.

Lake Tatlageac
Lake Tatlageac has a surface area of 1.78 km^2, a volume of 14 Mm^3 and a mean water depth of 0.7 m. Tatlageac lake is a river-marine firth, where nautical sports and fishing are popular activities. The lake is of high importance, especially due to the existence of mud with therapeutic qualities.

Lake Mangalia
Lake Mangalia has a surface area of 2.67 km^2, and has a limited source of freshwater. A channel connects the lake with the Mangalia Port basin. Salt concentration in Mangalia Lake gradually decreases with distance from sea. Mangalia Lake has many springs that arise from Sarmatian limestones, many of which are sulphate rich and relatively hot (220C).
Lakes Corbu, Tasaul, Siutgiol, Tabacarie, Tatlegeac, Techirghiol and Mangalia are significant coastal lake in the Dobrogea region which have been taken into account by ABAD-L when developing the RBMP under the Water Framework Directive. The water chemical quality of these lakes has been classified within the RBMP at other chemical status than good (i.e. failing) with a mean confidence level.

In accordance with State of the Environment Report 2010, NEPA Constanta, in accordance with the Water Framework Directive, assessment of ecological status of lakes was done for all lakes listed above, concluded that, except Lake Techirghiol - salty, which is a state "poor ", all other lakes are classified as a state avnd green" moderate ".

2.3. BIODIVERSITY IN THE AREA OF INTEREST A MASTER PLAN

2.3.1. Types of habitats in the Romanian seaside

In the Black Sea coastal area are presented many types of coastal habitats: submerged areas (infralittoral) with shallow water, sandy or rocky shores (mediolitoral), sand dunes, salt meadows, salt marshes, coastal cliffs, limestone plateaus. Among them, a special attention should be given to natural habitats of Community interest (SCI), specified in Annex I of the Habitats Directive whose conservation requires the designation of Special Areas of Conservation (SAC). For each habitat type presented in the coastal area between Cape Midia and Vama Veche, we will give a brief description, with the specifying plant associations characteristic or characteristic species. For coastal habitat types of interest are given Natura 2000 codes (according to Directive 92/43/EEC) or the classification of

Palearctic Habitats (DEVILLERS et al., 1997), for all the other there are specified the codes in accordance with athe manual 'Habitats in Romania "(Doniţă et al., 2005).

Tabel.2.3.1.1. Types of habitats

Habitat	Natura 2000 site	Representation (%)	Area (ha)	Location
1110 Sandbanks permanently covered by a layer of sea water than	ROSCI0065	A	4540.37	Infrashore shallow area on the banks of sand that come incontact directly with the medlittoral (breaking waves)
	ROSCI0066	70	86361.8	
	ROSCI0197	68	95.2	
	ROSCI0273	27	469.26	
	ROSCI0094	39	148.98	
	ROSCI0269	44	3051.84	
	0281 ROSC	20	2690.6	
	ROSCI0293	25	1219.5	
1130Estuare	ROSCI0066	25	30843.5	Mouths of the Danube, along the Gulf and Sacalin Musura and transitional waters of the Black Sea, up to 20 m isobath
1140sands and marshy areas covered by water at low tide	ROSCI0066	A	1233.74	Mediumlittoral, Supralittoral and sandy
	ROSCI0197	5	6	
	ROSCI0273	A	17.38	
	ROSCI0094	A	3.82	
	ROSCI0269	A	69.36	
	ROSCI0293	5	243.9	
1150 Coastal lagoons	ROSCI0065	2	9080.74	Razelm lagoon complex - and Lake Sinoe Zaton
Melee and bays 1160	ROSCI0066	2	2467.48	Musura and bath Gulf Sacalin
1170Recifi	**ROSCI0197**	27	37.8	infralittoral area and mediumlittoral area
	ROSCI0273	72	1251.36	
	ROSCI0094	60	229.2	
	ROSCI0269	55	3814.8	
	0281 ROSC	80	10762.4	
	ROSCI0293	70	3414.6	
1180 submarine structures gas leak creaed	ROSCI0237	20	1224.4	From the 10 m isobath and continuing beyond the continental shelf edge

1110 Sandbanks shallow submerged [Sandbanks Which is Slightly Covered by seawater at all times] There are benches and circalitorale infralitorale graded sediment average (from the sandy gravel) permanently submerged. Rarely exceeds 20 m depth, but in some cases can exceed 50m. Where

hidrodinamismul and lack of light does not permit the development of vegetation, are nude. In areas sheltered from waves, clear water that allows good light penetration, lawns are made of a vegetable or more species of sea grass (Z *noltii Oster, Stuckenia pectinata, Zannichellia pedicellata, RUPP sea).* This group of habitats not host large numbers of invertebrate species linked by trophic relationships established. Populations of mollusks, worms policheti, decapod crustaceans can reach here amfipode and high biological productivity, making important biomass. They are valued as food by juvenile flat fish, the sturgeon and other fish species of economic value.

In the Romanian Black Sea, the habitat is represented by the following ***subtypes:***

1110-1 Fine sands, clean or slightly malo, with meadows of *Zostera noltii*

Habitat is present at shallow depths (0.5-3m) in areas sheltered from wave action and prevailing winds, the substrate of fine sand (100-200 μ m). The shelter is often given protection dikes or natural rock formations (reefs), which together comprise the small bays.

Thick foliage of the grass high wave action diminishes, and with dense network of rhizomes, acts as a veritable trap for sediment. Sediments are stabilized, and the silt fraction is 5-10%. Dense bed is formed by rhizomes anoxic environment for endobentica fauna and has a high resistance to erosion than the surrounding sediment free, which is often raised from 20-50cm.

Characteristic fauna consists of large mobile forms that hide in foliage: guvid-the-grass *Zosterisessor ophiocephalus*, shrimp *Palaemon adspersus-de-grass*, crab *grass-de-Carcinus aestuarii*, seahorses *Hippocampus guttulatus* and high thread *Nerophis ophidion. Cerastoderma glaucum* mollusks epibentica Fauna *and Cyclope* include *shallow-water*, and the mollusks *Tellina tenuis endobentica, Loripes lacteus, Lucinella divaricata*, worms *Nephtys* policheti *hombergii* and decapod crustacean *Upogebia Glyceria tridactyla* and *pusilla.*

Meadows of sea grass habitat gives the high dimensional complexity and biological productivity. Many species find here their shelter, refuge from predators and abundant trophic resources, which explains in part the high specific diversity of this type of habitat. Seagrass meadows provide shelter and food for juvenile fish in the early stages of development payments are an important food resource for wintering seabirds us.

In Romania this subtype ***does not exist only in underwater sulphurous springs ROSCI0094 Mangalia.***

1110-2 Hydraulic dunes of medium sands

Habitat consists of sand grain moving average, as strong currents and wave action forms submerged sand bars or hydraulic dunes parallel to the direction of the mainstream. The sand accumulation over time, these structures can become emeritus, representing islands of sand bars moving or standing.

The fauna is highly variable in time and space due to sedimentary instability. Biodiversity is reduced, but populations are abundant species present.

Examples of this type of habitat are Sakhalin island in the mouth of St. George and associated submerged dunes and sand bar which tends to close emersion Musura bathroom.

1110-3 Shallow fine sands

The Romanian seaside, this habitat is present at the mouth of the Danube and to Vama Veche, where there are sandy beaches.

The substrate is composed of fine sand terigene (siliceous) or biogenic waste mixed with shells and pebbles, arranged from the shore up to 5-6 m isobath

In the north (from Sulina to Constanta), where the Danube freshwater influence is felt, this habitat is home to fine sands with *Lentidium mediterraneum* biocoenosis. Besides the dominant species *Mya arenaria* are characteristic *molluscs, Cerastoderma glaucum* and *Anadara inaequivalvis*, crustaceans *Crangon crangon*, and fish *Platichthys flesus Liocarcinus vernalis* and *Pegusa Lascaris.*

In the south, to Eforie Costineşti Comorova-Mangalia, where salinity is more stable, this habitat is home to *Donax trunculus* biocoenosis, which is characterized by abundant populations of this bivalve. Due to high hidrodinamismului, associated fauna is very diverse: *Cyclope shallow-water* gastropods, crustaceans and *Diogenes pugilator Liocarcinus vernalis*, but may be abundant.

Conservation Value: very high.

1110-4.Well-sorted sands

This habitat is disposed in the immediate continuity of shallow fine sands, from 5-6 m up to 8-10m depth in the north (from Sulina to Constanta) and 10-15m depth in the south. The substrate is composed of silica sand smooth, much less affected by wave agitation. Silt content of sediment increases with depth.

Characteristic species are molluscs *Chamelea Gallina, Tellina tenuis, Anadara inaequivalvis, Cerastoderma glaucum, Cyclope shallow-water, Nassarius nitidus, and Diogenes pugilator vernalis Liocarcinus crustaceans,* fish *Gymnammodytes cicerelus, Trachinus draco, Uranoscopus scaber, Callionymus sp., Pomatoschistus sp* ..

Conservation Value: very high

1110-5.Coarse sands and gravel little battered by the waves

Are found in natural rocky coves of the coast exposed and do not exceed a few tens of centimeters deep. Is in the form of very narrow submerged beaches consisting of coarse sand and gravel derived from the degradation of rock, the waves continually repaired ones.

1110-6 .Infralittoral buckets

They meet here and there along the rocky coast exposed naturally, between depths of 0.5 and 2.5 m. These beaches are partially submerged rocks covered with round and flattened (buckets), usually limestone, white, shaped by waves. Occur only in areas with strong and are populated hidrodinamism izopode crustaceans, and crab *Xantho* amfipode *poressa.*

1110-7 Shallow sands bioturbated of Arenicola and Callianassa

Habitat is fragmented distribution, covering small areas scattered on the beaches south of Cape submerged Midia, between 4 and 7 m depth. It is best represented in the Cap Aurora sites and Mangalia. At the top (4-5m) habitat is contiguous with 1110-3, where it extends up to 7m deep. The sand is bioturbat to a depth of 1m and the sediment surface is marked by characteristic funnels and *Callianassa* mounds and *truncated* cones attached manure *Arenicola marina.* Value conservative high

1110-8.Muddy sands and muds SandS bioturbated by *Upogebia*

Habitat forms a continuous belt along the coast Romanian on shore located between 10-30m depth. The substrate is riddled with numerous galleries of *Upogebia pusilla* thalassinid Decapoda Crab, which penetrate deep 0.2-1m, depending on sediment composition. *Upogebia* populations are very dense (100-300 ex / m $^{2)}$ and cover very large suparafeţe, biofiltration, and resuspensia bioturbaţia sediment carried by these crustaceans have a notable influence on the ecosystem.

Decapod crustacean species is edifying *Upogebia pusilla* thalassinid, which feeds by filtering organic suspension plactonul and stream pumps you continuously through its galleries. Bivalve molluscs is low density in this habitat due to food competition and planktonic larvae and postlarvelor predaţiei by *Upogebia.* Other species, particularly commensal living in *Upogebia* galleries, are facilitated.

Conservation Value: very high. *Upogebia* thalasinidului role in biofiltration benthic-pelagic coupling and ensuring the functioning ecosystem is essential.

1130.Estuaries

The mouth of the Danube, with baths and Sacalin Musura and Black Sea waters in front of them until the 20 m isobath is estuarine waters. Waters of the Danube Delta are substantially influenced by freshwater inflow. Mixture of freshwater and marine sediments leads to precipitation of fine and streamline and currents often carry these sediments. This habitat includes midlittoralul, infralitoralul and circalitoralul, characterized by low salinity surface water upstream and entering a deep layer of sea water. These waters are home to communities of specific estuarine plants and animals. Therefore, although there is high (as in the Mediterranean and Baltic) and did not form typical estuary, these waters are a habitat estuarin variable salinity, relatively close to the Baltic Sea.

Characteristic species are molluscs *Abra segmentum, Cerastoderma glaucum, Mya arenaria, Hydrobia* spp policheţi *Hediste diversicolor worms, Capitelli capital,* and crustaceans *Corophium* sp. *Dikerogammarus* sp.

Conservation Value: High

1140-1 Supralittoral sands with or without fast-drying drift lines

Present on the Romanian seaside beaches. Occupy the beach which is not wetted by waves only during storms. Deposits are composed of materials to large vegetable (tree trunks, pieces of wood, and swamp land plant debris, algae, leaves), animal (dead aquatic animals, insects, animals drowned land) or

anthropogenic (waste solid) and dense foam derived from marine plankton. The fauna is made up mainly of crustaceans and insects isopode.
Conservation Value: Low

1140-2 Supralittoral slow-drying drift lines

Currently composed of boulders on the shores or beaches buckets (Agigea, Tuzla, Vama Veche). Handle portion which is not wetted by waves during storms than the shores or beaches formed by rocks buckets. They accumulate in the spaces between them remains described above, and humidity, so it dries hard deposits. The fauna is made up of detritivori, decomposers and their predators.
Conservation Value: Moderate

1140-3 Midlittoral sands

Present on all sandy beaches of the Romanian seaside. Holds strip of sand from the shore, the waves that burst. Depending on the degree of agitation of the sea, it may be wider or narrower, but the Black Sea is still limited due to negligible tidal amplitude. The sand is loose, coarse and mixed with shells and pebbles scrap.
Species typical of the beaches of southern Romanian coast (Eforie, Costineşti, Mangalia, Vama Veche) is bivalve *Donacilla cornea,* and the beaches of the coast amfipodul *Euxinia maeoticus* Delta.
Conservation Value: very high.

1140-4 Midlittoral detritus on shingle and boulders

Habitat is present in rocky shores midlittoralul (Agigea, Tuzla, Costinesti and Vama Veche), the substrate of boulders, gravel buckets or, in detrital deposits supralitorale continuitare with slow drying (1140-2).
Shore consists of boulders, gravel buckets, which accumulates mainly algae death. When the amount is in excess of organic compounds, degrades habitat, hypoxia and anoxia can occur locally, affecting habitats and biota of infralitoralul contiguous.
The fauna is represented by the genera *Idotea* isopode and crab *Pachygrapsus marmoratus* and *Sphaeroma.* Value conservative: low

1160 -1 Malo sands in sheltered areas

This habitat is the bathroom (embayments) and bath Sacalin Musura Bay. Sandy habitat is located in protected bays with peaceful waters whose depth does not exceed 3 m. The sand malo located in areas sheltered, shallow, develop a rich vegetation and diverse fauna, both marine and salmastricole elements.
Floristic *composition: Zostera marina, Z. noltii, Zannichellia pedicellata, Najas marina.*
Conservation Value: very high

1170-1 *Ficopomatus enigmaticus* biogenic reefs

This habitat is found in sheltered waters but with a slight wave current, preferably with variable salinity. Premises legărtură ports and channels of the sea and delta are the places where it is easiest to find.
Worm reefs are built by polichet tubicol *Ficopomatus enigmaticus* whose calcareous tubes grow crowded and cemented between them on any hard substrate, including strains of *Phragmites* reeds. Biogenic reef building are similar to worms *Serpula vermicularis* policheți tubicoli Atlantic coast of Europe, the difference being that *Ficopomatus* prefer sheltered waters of the waves, with a slight current and variable salinity. The fauna is extremely diverse, contrasting with the surrounding sedimentary areas.
Conservation Value: Great. Habitat is a very original, very localized and a high specific diversity. A reef can accommodate 50 species macrozoobentice. This habitat plays an important functional, both in terms of food, due to high densities (ie 245 250 m $^{-2)}$ and areas they cover and in terms of biofiltrării, *Ficopomatus* reefs of being able to improve significantly the quality water in which it grows.

1170-2 *Mytilus galloprovincialis* biogenic reefs
Mussel reefs occur on sedimentary substrate (mud, sand, scrădiş or mixture), most commonly between 35 and 60 m. izobatele are spread throughout the Romanian coast, between izobatele above.
Biogenic reefs of *Mytilus galloprovincialis* mussels consist of banks whose shells have accumulated over time, forming a hard raised to support the surrounding sediments (silt, sand, scrădiș or mixture), the living mussels living colonies . Sedimentary habitats with substrate of the Black Sea, it accommodates the specific diversity due to its expansion to a wide range of depths and because of the many reefs of mussels microhabitate matrix that provides living conditions for a wide variety of species.
This reef is unique crucial ecological role in self-cleaning benches ecosystem mussels and benthic-pelagic coupling realization, by the existence here of several species, the importance of socio-economic as habitat for many species fishery value Commercial *(Psetta maeotica, Squalus acanthias,* Acipenseridae, Gobiidae, *Rapana venosa).* Floristic composition: *Peyssonellia rubra, Phyllophora nervosa, Lithothamnion crispum, Lithothamnion cystoseirae, Lithothamnion propontidis.*
Conservation Value: very high. Mussels themselves are the species of molluscs consumed by people around the Black Sea, and schools of mussels are a source of larvae for aquaculture and rear.

In the interest area of the Master Plan we can distinguish the following bird's main coastal habitat:

- Black Sea. It's free water surface of the sea close to the shore. Here you can find shelter bird species good flying ,good swimmer belonging to *Gaviiformes, Podicipediformes, Anseriformes, Charadriiformes* orders and species *Fulica atra.* Of course, this is not a place of reproduction, it is only a place of rest and feeding.
- Beach Marina. There is a series of beaches in the area studied. They are good seats and parking for speciesof *Charadriiformes* (waders, gulls and terns). There should be good places for

nesting and for these species, but because of tourists and other anthropogenic activities practically beaches can not be used for breeding.

- Clay cliffs. These cliffs are found mainly on the seafront promenade of Tuzla and Costinesti or between May 2 and Vama Veche. These are areas less affected by human influence, and still can be good places for nesting species who nest here, such as *Falco tinnunculus, Coracias garrulus, Merops apiaster, Sturnus vulgaris, Passer montanus.* Are important places for birds, which must be protected.
- Coastal steppes. In Romania this habitat almost not there (in the coastal area) due to human aggression. This characteristic bird nest open areas such as *Burhinus oedicnemus, Melanocorypha calandra, Alauda arvensis, collurio Lanius, Lanius minor, Anthus campestris, Motacilla alba, Passer montanus,* etc..
- Coastal lakes. More or less influenced by human activity lakes are excellent habitats for a wide range of bird species. Basically, here we can meet many ecosystems, from beaches, reed, open water areas or bushes on the shore, good places for birds, both nesting and resting or feeding on. Only mention wetlands Techirghiol (Banica, G., 1996) and Marsh stud (Banica, G. 2000).
- Forested areas. There is no forest, in the true sense, in the studied area. But there are some areas with trees and bushes, like grasslands, are parks that are good habitat for a wide range of passeriforme. Usually not good nesting places, but during migration and winter are good refuges for many species of birds.
- Anthropogenic habitat. Here you can meet birds characteristic towns and ports. Have a negligible contribution at all, especially as some species have been recently quite conquer this new territory, as *Larus cachinnans* as a species breeding in cities on the Romanian coast.

Western shore of the Black Seais also the place where important routes of birds migration pass. Here you can meet and Sarmatian Pontic migration routes followed by a wide variety of species. This means that in spring and autumn, Romanian coast, is the throughput of a large number of birds, especially aquatic birds, and birds *(Passeriformes)* and birds of prey *(Falconiformes).* Most species of migratory birds in the Danube Delta is going this way. Nesting birds in north-eastern Europe and even Asia Northwest flies, in most cases, all along the western shore of the Black Sea. For this reason, the existence of places of rest, resting and feeding for birds is very important for their survival. There are many aquatic species coming from northern Europe and northern Asia to winter in the wetlands on the shores of Dobrogea, which increases the diversity of coastal ornithofauna (Munteanu, D., Toniuc, N., Weber, P., Szabo, J ., Marinov, M. 1989). The best example, we believe that consists of red breasted goose *(Branta ruficollis),* which is the main place of wintering Dobrogea of this beautiful species. To show the importance of this area for water birds wintering here, we must mention that ***the numbers of orders Gaviiformes species, Podicipediformes, Pelecaniformes, Ciconiiformes, Anseriformes, Gruiformes and Charadriiformes,*** in this time of year, may amount to almost one million of copies.

2.3.2.Current marine biodiversity in 2010

Marine biodiversity of the Romanian coast was characterized by values of the specific indicators. Biodiversity status was defined by the total number of species identified at the Romanian coast and the number of threatened species (CR, EN and VU). In the past 15 years, in the Romanian marine waters have been identified over 700 species of marine main groups mentioned above. (phytoplankton, zooplankton, macrofitobentos, zoobentos, fish and marine mammals). During 1996 - 2009, were identified, on average, 200 - 300 species annually. In 2010, we identified over 300 species of the groups mentioned above. Threatened species categories CR, EN and VU raised to a number of 48 in the red list, 26 of which were identified in 2010.

Pressure on biodiversity has been expressed by the existence of 29 exotic species (of which 18 are included in the list of invasive species in Europe, established in 2006), 8 species commercially exploiting (6 fish and shellfish 2) and 12 types of human activities affecting the conservation status of biodiversity.

Impact on biodiversity has been assessed by the ratio of endangered species / total number of species identified in 2010, ie 26/345, and the number of missing species / total number of species, ie 7 / 750, was the only species *Mugil* autoaclimate *soiuyi.* The number of endangered species (48) Red List includes species classified in the categories CR, EN and VU of the IUCN categories of endangerment considered proper.

The answer recorded in the environment and environmental policies has been evaluated by the ratio of protected marine species / total number of species, ie 16/750 (not birds), considering species protected by GEO 57/2007.

Phytoplankton

Identify qualitative and quantitative structure of phytoplankton component as an indicator of eutrophication status was made after analysis of samples collected during 2009 (February, May, July) on profiles established along the entire coastline on izobatele 5m, 20m and 30m. The continuity of the results is based on the analysis of taken samples from Station Casino .

The continuity of the results is base on the analysis of samples (77 samples taken from station Casino Mamaia) were identified 133 algals taxonomic groups (Bacillariophyta, Dinoflagellata, Chlorophyta, Cyanobacteria, Chrysophyta, Euglenophyta and Cryptophyta). The dominant, in terms of specific diversity, belongs to the group of Bacillariophyta which is 38% of all identified species, followed by 25% dinoflagellata groups Chlorophyta by 18%. Marine species and marine-salmastricole represents 61% of all species and the freshwater and freshwater-salmastricole 39%. As in the previous year

nondiatomee species continue to exceed those of diatoms numerically representing only 38% of all species.

The yearly evolution of multi numerical density of phytoplankton from the Romanian Black Sea waters ranged in general tend to decrease, as a result of mitigating eutrophication, manifested in intensity during the years.

In terms of qualitative composition of the Black Sea phytoplankton were recorded 145 species belonging to 7 algal groups: *Bacillariophyta, Dinophyta, Chlorophyta, Cyanophyta, Chrysophyta, Euglenophyta, Cryptophyta.*

The phytoplankton composition of ecological groups were present both marine and marine forms and many species salmastricole freshwater and freshwater - salmastricole from Danube waters.

Considering the numerical density and biomass values of phytoplankton recorded in Romanian continental waters up to 30m isobath, which in 2009 ranged between 0.12 to 16.6 · the · l-1 106, 315.87 respectively - 9186.63 mg · m-3.Distributia phytoplankton was characterized by a concentrated biomass inzona doors in February and the constant profile and gates in May. -1809.98 Biomass Valoreamaximă mg/m-3 - recorded in February the bracket profile was represented in proportion of 89% of diatoms. In May, the maximum biomass of 9186.63 mg/m-3 was about. five times greater than the maximum of February, being reached on the profile of Constanta. Of the value of 9186.83 mg/m-3 species Chaetoceros biomass was curvisetus 66% of the total. In winter, spring and late autumn the phytoplankton diatom species were present represented by *Thallassionema nitzschioides, Navicula sp. Sceletonema sp. Melosira moniliformis.* Summer, qualitative structure of the flagellate dominated fitoplancontului is represented by *Peridinium sp. Ceratium sp. Prorocentrum cordatum, Ceratium triple* and diatoms represented by: *delicatissima Nitzschia, Nitzschia tennuirostris, Leptocylindrus danicus, limestone-avis Rhizosolenia*. Diatoms dominated both qualitative structure, and the quantitative fitoplantonului, the main species being *Nitzschia delicatissima, Cerataulina pelagic Chaetoceros socialis, Skeletonema costatum, Chaetoceros curvisetus, Cyclotella* their *Caspian* and euglenofitul *Eutreptia* adding *lanowii.*

Zooplankton

In terms of quality in the Black Sea zooplankton were present in examined sections the species belonging to the following groups of organisms: cilia, rotifere, copepode represented by *Claus* and *Centropages Acartia ponticus,* represented by *penile* cladocere *Sagitta* chetognatul *avirostris* and *thirsty.* In 2010, zooplankton was dominated by trophic component in March and August, and the neotrophic dominated in May and July. The qualitative structure of zooplankton were identified 33 taxa belonging to 16 taxonomic groups. *Noctiluca* Dinoflagelatul *scintilans,* copepodele *Acartia claus,*

Pseudocalanus elongatus, Paracalanus parvus, cladocerul *Pleopis polyphemoides, Oikopleura dioica* and chetognatul apendicularul *Parasagitta thirsty* were constantly present in the samples analyzed. Romanian seaside in northern freshwater species were found - *Daphnia cuckoo*, D. *longispina*, *Chidorus sphaericus as* a result of the Danube water *intake.*

During 2010, it was identified first in *Oithona brevicornis* Romanian seaside species, species already reported in the Black Sea by Ukraine and Russian researchers. Species can be considered adapted to the conditions of the Romanian seaside, given the large number of copies observed and that females had more copies ovigeri bags filled with eggs.

Fitobentos

To study the biological elements were sampled in both winter (March and November 2010) and in the summer (June-August) in perimeter between Năvodari and Vama Veche. He identified the year 2010 a total of 27 taxa (25 species and 2 variations), emphasizing dominance, in terms of diversity of specific species of încrengăturii Chlorophyta -12, which is 44.4% of all identified species, followed by phylum Rhodophyta - 8 species and 2 varieties of *Ceramium rubrum* species, 4 species of Phaeophyta încrengăturii *(Cystoseira barbata, scoring latifolia, Ectocarpus siliculosus, Scytosiphon lomentaria)* and 1 phanerogam marine *(Zostera nana).*

Green algae dominance, largely due to the genera *Cladophora* and *Enteromorpha* proliferation was demonstrated in 2010 (as in previous years) and quantitative level. Thus, the picture algal vegetation in summer 2010, has a note printed dominant feature of opportunistic species: *Ulva Lactuca* (1315 g/m2 wet biomass, 650 g/m2 bu), *Enteromorpha* sp .- bu 577.5 g/m2, *Cladophora Albida* - 315 bu, *C. serum* and *C. vagabunda* - 335 g/m2 bu and, of red algae, *Ceramium* like *(C. rubrum, C. diaphanum)* dominated the hard substrate - 1737 g/m2 bu If, in summer 2010, have dominated the genus *Cladophora* species, in November 2010 , who developed the species *Ceramium rubrum* was abundant (1400 g/m2 bu), which has a marked ability to reproduce. *Enteromorpha* sp. (750 g/m2 bu) proliferated intensely cold period of 2010 in the southern (Mangalia - Vama Veche).

Of brown algae, with special attention given to perennial species *Cystoseira barbata,* particularly important for marine ecosystem, found in 2010 along the coastal strip Mangalia - Vama Veche. Thus, the field of *Cystoseira* in Vama Veche is well developed, compact, composed of large specimens with a lower degree of epifitare in 2009 and a considerable wet biomass. A positive fact was observed in Mangalia, where young plants were identified by *Cystoseira form* of dense clumps.

Zostera nana (dwarf seagrass) was reported as in 2009, as a well-developed grasslands in Mangalia, and the previous year in 2010, the species was found at lower depths. An epiphytic species the presence

of mention is *Acrochaetium thuretii,* red algae clean water indicators, which heavily colonized in summer 2010, spring vegetable substrate offered by *Zostera.*

Another positive aspect is that of identifying a species considered extinct from Romanian Black Sea coast - *Lomentaria clavellosa* (Rhodophyta), which in the past, form complex associations (with *Antithamnion cruciatum)* and water mark .

Zoobentos

The year 2010 still presented a constant evolution in terms of species diversity. Qualitative assessment, on all areas monitored, led to the recording of 50 species macrozoobentale, picture preserving the characteristics fauna of previous years. There was a massive development of detritofage endobentice species, especially species polichete, *Dipolydora quadrilobata*, *Capitelli capitata*, *Polydora cornuta*, *Heteromastus filiformis*, known as the dominant species, especially in areas with high organic load in sediments and polluted areas. The recorded values of zoobentos, in the north sea coast were up to 1.4 times lower (Sulina - Gates - 5628 ex/m2) compared with 8114 ex/m2 in the years of 2008-2009. The same situation was observed in the biomass, with an estimated average of 189 g/m2, with a 2.2-fold reduction compared with 2008, when biomass recorded was 425 g/m2.

In the southern sector (Eforie Sud - Mangalia) the quantitative density indicator increases over two times higher compared with 2009, recorded, however, a reduction of up to four times lower values of biomass (88 g/m2) compared with assessments in 2009 (327 g/m2), the contribution of live weight increase of biomass values was more significant compared to 2010. To conserve and improve some parts of coastal ecosystems, a solution is required to limit eutrophication, by controlling the discharge of greenhouse fertilizer, special restrictions on wastewater discharges, especially in summer, given the fact that species with a low tolerance - sensitive recover harder when natural pressures and / or human are higher.

Ichtyofauna

In the Black Sea have been identified about 1,500 species of vertebrates and invertebrates. Following the rise of industrial and urban pollution in the last two decades it has beeb have found a reduction in predatory fish species and fish species of economic importance: mackerel, turbot, anchovy, mackerel, sturgeon. In 2010, in the Romanian marine sector, commercial fishing was done in two ways: fishing with active gear, coastal trawler ships carried out at depths greater than 20 m, and fishing with fixed gear, practiced along the coast, 20 points fishery, located between the Sulina - Vama Veche, shallow (3-11 m).

Biomass for the main fish **stocks** indicates:

- At the ***sprat (Sprattus sprattus),*** which usually presented a natural fluctuation, almost normal and actually quite good, biomass is estimated at 60,000 tons, as in the past four years.
- To the ***bacaliar (Merlangius*** *merlangius* ***Euxinus),*** biomass was estimated at 11,000 tons, with about 15% higher than estimates in recent years;
- At the ***turbot*** biomass was estimated at about 1,300 tons, a value lower than 2008 and close to that of 2007;
- The **shark** biomass was 2,500 tons higher compared with that of 2008 but lower than 2007 (4.300 tons)

Population structure indicates, as in previous years, the presence of the capture of a greater number of species (over 20), of which the base was so small species (sprat, anchovy, bacaliar, guvizi) and the higher class (turbot and shad). Remarkable low share shark species, mackerel, garfish, mullet and blue fish, and recurrence as isolated specimens of blue mackerel (mackerel) and Atlantic bonito.

The situation of endangered species

Red List species of macrophytes, invertebrates, fish and mammals, the status indicator for marine biodiversity in the Romanian marine sector was completely updated in 2008 and only fish in 2009. It includes 223 species classified in eight categories IUCN (IUCN categories according to v. 3.0 in 2003, and guide their application versions 2004 and 2006), namely: 19 macrophytes and higher plants (8.5%), 58 invertebrates (26 %), 142 fish (63.7%) and 4 mammals (1.8%)

Of macrophytes algaes and Schedule fanerogames listed in the red list, in the summer of 2009 was identified brown alga *Cystoseira barbata,* endangered species (EN), south coast of the littoral, near Mangalia - Vama Veche. In Mangalia Area, Cystoseira population is much better represented than in the marine rezervation, being present as dense clusters, and opportunistic taluns species are strongly emphesied by the the genera epiphytic Enteromorpha, Cladophora and Ceramium. In the same area was identified Zostera noltii phanerogame whose populations are also staple. IUCN categorization includes six categories for their (RE, CR, EN, VU, LC, DD): a species (5%) considered extinct in the region (RE), 3 (16%) - Critically Endangered (CR) 7 (37%) - Endangered (EN), 3 (16%) Vulnerable (VU), 2 (11%) of Low Concern (LC) and 3 (16%) with enough data (DD). In the case of invertebrates, the 58 species included in the list were included in eight categories: RE (6-10%), CR (12-21%), EN (6-10%), VU (8-14%), NT (1-2%), LC (11-19%), DD (12-21%) and NA (2 species - 3%). Of the four species of copepode calanide *Anomalocera Paterson, Labidocera brunescens, Pontelli mediterranea* and *Centropages ponticus* in 2009 were reported only two (Centropages ponticus and Pontelli mediterranea). Of benthic invertebrate species endangered status recorded in the Red List, in 2010 16 were identified as: *Donax trunculus* (VU), *Paphos aurea* (VU), *TRICOLORI pullus* (CR), *Calyptrea chinensis* (VU), *Clibanarius erythropus* (CR), *Carcinus aestuarii* (EN), *Callianassa truncated* (VU), *Eriphia verrucosa* (NT) and *Arenicola marina* polichetul (VU).

Employment fish species IUCN categories was changed completely in 2009, their conservation status assessment taking into account the categories that were included in the IUCN worldwide. Applying the methodology for assessing the conservation status of species at the regional level, the fish were now employed only in five categories: EN, VU, NT, LC and DD, most species (77-54%) is widely DD, followed de - LC (32-23%). Species included in the categories of endangerment (EN, VU and NT) are together less than a quarter (23%) of all those listed in Schedule (Tab.6.4.2.3.1). Of the 41 species identified in 2009, three are part of VU *(Acipenser stellatus, Trachurus mediterraneus* and *Alosa pontica pontica ponticus),* 13 of the NT, and 6 species with insufficient data category (DD). The latter will be replaced in coming years is in a class of hazard, or in low-risk category (LC). In terms of marine mammals, dolphins not enen in the year 2010 weren't the subject of a special monitoring program.However between of these could be seen cards made up of 2 to 50 individuals, both close to the shore, and also in large areas, especially in summer. It also identified 18 dolphins were stranded on the shore of which 13 copies of *Phocoena phocoena* and *Tursiops truncatus* 5. Please note that 90% of dolphins from nets fail turbot illegally installed. The assignment of the three species of dolphin *Delphinus delphis, Phocoena phocoena* and *Tursiops truncatus* remained the same as in the previous assessment, namely Threatened (EN) both at the Black Sea level and at national level, although in the IUCN Red List, only *Tursiops truncatus* species is listed as vulnerable (VU), the other two being low risk (LC).

2.3. Climate change

Until recently, the development plans and processes did not take into account the erosion and the risks to a large extent so as to permit information currently available. In some cases the way they were managed in the area of coastal natural processes had resulting and problematic changes . These approaches have left behind a legacy of complex and difficult to manage, raising questions about sustainability, aggravated by potential future climate change, rising sea levels and, last but not least, the increasing involvement of communities and public affirmation. There is no specific information published estimates of future sea level rise relative to the Black Sea coast of Romania as a result of climate change. Reports of the Intergovernmental Panel on Climate Change (IPCC) provides global estimates for sea level rise, but they are of limited applicability to the Black Sea due to limited connection global oceans and the importance of basin water balances compared with main river discharges and flows through the Strait Bosphorus [1.] The increasing current relative sea level (ie in the last century) is between 2.8 and 3.1 mm / year (Dan *et al.,* 2009.), which takes into account the increase Eustathios (global) sea level at around 1.3 mm / year (Malciu, 2000) and subsidence of about 1.5 - 1.8 mm / year (Panin, 1999). Although this is not a critical value, must be considered in the context of storm events, reduced volumes of the beach and anthropogenic controls on the coast. In addition to rising global sea level, should be considered inter-regional variations of sea level changes resulting from the water cycle, short-term local changes resulting from storms and SEIS. Panin (1999) analyzed the impact of sea level increase the flow of the Danube solid and liquid, while maintaining constant

control of other factors. He concluded that it appears more pronounced penetration of the wedge of salt water on the river branches, which would affect bottom sediment load transport in the mouth and later in the season. On shore, the direct impact of rising sea levels will increase the level of the waves, which would result in deeper waters closer to shore and therefore would cause large waves to shore. In many cases this can lead to increased erosion, especially where beaches are flanked by rocks or hard structures. Throughout the South Unit, the lack of sediment beaches already going and therefore the net impact will be the loss of beach sediment, which in turn will increase pressure on high area of the beach. If that means beaches are coastal protection devices, increased exposure due to beach erosion and greater wave to shore is likely to accelerate erosion base, increase the risk of deferlare and reduce the life of the means of defense . Along the North Unit, any sediment will probably be launched redistributed along the coast and therefore a certain period, some areas are likely to continue to grow. During the opening of the delta, there is more space available and thus have more beaches to expand inwards through processes of overflow (type "overwash"). Giving to coastal cords Razim-Sinoe complex will be particularly vulnerable to big waves, but it can compensate if the sediments in these areas move north. Likelihood of this happening is, however, uncertain as Sakhalin Island is now working as an area of sediment deposition. On the basis that any future change in terms of estimated climate variability is within the natural waves now known not sight any significant change in sediment transport regime (see three-dimensional hydraulic modeling report). Over the soft loess cliffs, erosion rates are expected to increase when the cliffs are unprotected because of increased exposure, the waves acting on a higher level. Erosion of these cliffs will not, however, creating training materials beaches and therefore will not be the beaches as a result. There are a number of dune systems along the Romanian Black Sea coast, including the Sulina and north of St. George. Answer these dunes to future sea level increase will depend on their current state, the reserves of sediment dunes - beach sediments and subsequent intake. It may extend to the shore dunes in the event of sea-level rise scenario, sediments being redistributed on the dry side hills. However, this means that remain in coastal sediments and are not permanently lost during storms self. Dune systems are very sensitive to any change in terms of frequency and severity of storms. Both Panin (1999) and Stan and Panin (2009) have tried to assess how higher sea levels will affect the average rates of erosion along the coast. Panin (2009), by applying the Bruun rule and considering the prevailing wind direction changes and the influence of rising sea levels on the Danube water and sediment flow, estimated that a sea-level rise of 30cm by 2030 would cause additional erosion from 3 to 5m/an. When using a lower growth scenario of sea level (from 12 to 14cm by 2030), Stan and Panin (2009) have determined that this would induce a withdrawal of 1.5 2m/an. Modeling shore performed as part of this study (see report Modeling shoreline) applied at a rate of sea-level rise of 3.3 mm / year, which equates to a 10 cm rise in sea levels in the period 2010 - 2040. Bruun rule was applied, using specific parameters for different Sitel sites along the coast. Bruun rule is a simple relationship that links the withdrawal of shoreline and sea level rise. From these calculations, the average withdrawal shoreline associated with an increase in sea levels of 10cm was estimated at 5m, but in a range between 2.5 m and 9.0m. The highest value was forecasted for the withdrawal of perishable and Periteasca shore. All these estimates assume a linear

increase of sea level rather than accelerating it and do not take into account any additional reduction in the content of sediment transported to the coast. Should also be noted that the predicted response of the beach, the Bruun Rule is much lower than currently experienced throughout the greater part of the coast. Rising sea levels of this magnitude would also have as a result, flooding a large area of the delta and also would induce a higher risk of flooding along the entire area of the delta, especially given the input low current sediment, caused by human intervention in the Danube basin. Due to lack of published guidance on future scenarios for sea level change, for the interest on these two scenarios were developed to provide a baseline and most grim scenario for Master Plan.

- Reference case assumes that the recently observed rates continue during the 30 years the Master Plan, namely 2mm/an for 30 years, which equates to a total of 6 cm during this period.
- I Potez most unfavorable situation is about 30cm increase in 30 years. This is selected as a rough equivalent of the values used in other European countries, for example, rates of shoreline management plans Kingdom (DEFRA 2006) are equivalent to about 1m plan for a period of 100 years.

2.4. Population and human health

Taking into consideration the context of the entire coastal area, the population distribution highlights the demographic difference between the settlements within Tulcea County and those within Constanta county. In terms of population density, the coastal area in Tulcea County has a density of 6.41 inhabitants/km2, and in Constanta County the density is 2,420 inhabitants/km2. An important influence on these values is the wider separation of counties in the north, comparing with those in the south of the coastal area. From a development perspective, considering the coastal area and the entire South- East development region, the Municipality of Constanta represents the most important and dynamic component. It is characterised by its strong investment attractiveness, an increasing proportion of tertiary activities and a real development potential in the future. The Municipality of Constanta ranks in the top 10 cities in the country with a population of 309,676 inhabitants. Table 2.4.1 presents significant urban development associated with the Romanian coastal zone According to data from the period 2002-2008, the population of the Black Sea coastal area grew by 5020 people. At the same time, both urban and rural residential average draw attention to the declining urban population with 7167 inhabitants and a growing population of 12 127 rural inhabitants. In terms of population dynamics, one can speak of an increase in population in central areas of coastal habitat and population decline at its extremities. Based on 2002 census population characteristics can be defined socio-economic structure of the stable population of urban coastal area. Thus, 76.5% of the total urban population of Constanta and Tulcea counties are found in coastal areas, the urban population in the coastal zone, 79.6% and 77.6% were inactive population were unemployed in the two counties. Also, employment in urban coastal area is about 85.2% of the total active population. Unemployment rate of 25.6% in extreme Eforie city and 12.5% in Constanta, and the average unemployment in the urban coastal zone was 14.8%. In terms of population distribution on the structures of economic activities, about 61% of the

population was registered in teritiar sector of activity, a sector which is so well represented. In the study area for the coastal area presents these locations with a high share of employment in tertiary activities: city of Constanta with 71.5%, with 70.8% Techirghiol towns and villages Sulina with 75.9% and 63 Agigea , 1% and to 68.5% Costinesti. Moreover, regional and national coastal zone are differentiated by the increased share of population in the service sector (61.4%). At the opposite, these cities have a higher percentage of employment in primary sector of activity: Murighiol with 74.0% and 75.1% with Michael the Brave. Regarding the number of employees of the Coastal Zone, in the period 2002 - 2008 there was an upward trend, increasing by about 13.8%, manifested both in the urban growth area (14.1%) and in areas this to (9, 5%). Evolution of the number of registered unemployed in the period 2008 - 2010 reveals an increasing trend in the coastal zone. If at the end of March 2008 registered a total of 7298 were unemployed in March 2010 the total number of unemployed increased to 17,816, with almost 150%. Starting with the year of 2006 a number of tourist resorts on the Romanian seaside were classified as national interest. In the study found among these we find Mamaia, Eforie, Costinesti, Jupiter, Mangalia, Neptun-Olimp, Saturn, Mangalia, Techirghiol and Venus.

Accommodation capacity. Compared with other administratively territorial units in the area, ***Mangalia*** provides most places: **50 689** to 254 units, followed by ***Eforie*** with **25,321** units in 339 and **24 978** in 138 units ***Constanta.*** Follow ***Navodari and Costinesti*** with a number of places between **6000 and 11,000.** In terms of territorial administrative units of the Delta, ***Sulina and St. George*** each category ***Murighiol*** fit with **200-400** beds. As a trend on the number of places in the entire coastal zone has been a fall in the years 2007 and 2008.

Table 2.4.1. *Network coastal settlements (Sources: http://www.ghidulprimariilor.ro for people in Tulcea county, the inhabitants of the NIS files for Constanta county residents: 2005 / 2003 data, 2009 / data from 2007, 2011 / 2009 data*

Cities	Statute	Population (Supreme)	Administrative area (Ha)
CA Rosetti, Tulcea County	Common / Rank IV	1256	26 636 ha
Sulina, Tulcea County	City / Position III	4634 (2007)	33 196 ha (2007)
Saint George, Tulcea County	Common / Rank IV	2001	7127 ha
Murighiol, Tulcea County	Common /	3876	84 046 ha

	Rank IV		
Jurilovca, Tulcea County	Common / Rank IV	4977	30 263 ha
Michael Kogalniceanu, Constanta county	Common / Rank IV	3323 (2003)	20 622 ha (2003)
Istria, Constanta county	Common / Rank IV	2645 (2009)	17 063 ha (2009)
Sacele county Constant	Common / Rank IV	2248 (2009)	11 367 ha (2009)
Corbu, Constanta county	Common / Rank IV	5960 (2009)	18 620 ha (2009)
Kogalniceanu, Constanta county	Common / Rank IV	9996 (2005	16 097 ha (2005)
Navodari, Constanta county	City / Position III	35.686 (2009)	5844 ha (2009)
Constanta, Constanta County	City / Rank	304.279 (2007)	12 489 ha (2007)
Agigea, Constanta county	Common / Rank IV	6822 (2009)	4789 ha (2009)
Eforie, Constanta county	City / Position III	10.248 (2009)	738 ha (2009)
Tuzla, Constanta county	Common / Rank IV	6228 (2003)	5735.76 ha (2003)
Costinesti, Constanta county	Common / Rank IV	2587 (2009)	2028 ha (2009)
23 August, Constanta County	Common /	5448	7494 ha

	Rank IV	(2009)	(2009)
Mangalia, Constanta county	City / Position II	40.044 (2009)	6224 ha (2009)
Limanu, Constanta county	Common / Rank IV	5902 (2009)	6666 ha (2009)

Therapeutic tourism structures. Basis of treatment of Romanian seaside resorts harness the features of the marine bio climate and seawater composition, the properties located on on lakes coastal and sludge. In the study area, these resorts are found in cities Mamaia, Eforie, Techirghiol, Neptune, Saturn and Mangalia.

Recreational structures. The most important recreation bases (which presents facilities for recreational activities, free circulation category of beaches, water sports, amusement parks, sports fields, etc.) is located in the following cities: Mamaia, Eforie North, Saturn, Neptune.

2.5. Likely evolution of the environment without implementation of Master Plan

Not implemented the Master Plan Alternative involves the lack of investments coordination from specific water management, coastal protection / erosion risk reduction and increased pressure by abandoning and / or stagnation of development projects for the following sectors:

- Population - protect against exposure to the risk of erosion
- Industry - Tourism
- Transport-use potential recreational waterway

Indicator of exploitation of these uses is the provision of a clean environment and ensure safety in the coastal population. To assess the effects of non implemented alternative of Master Plan, was developed a scoring system applicable to its specific proposals, this type of view allows evaluation of the impact size with relative objectivity, but through cuntificabile and comparable features, unlike the purely subjective qualitative observations .

Characteristics of the effects	**Score (+ positive / - negative)**			
	A	2	3	4
Probability of event	Null	Accidental or rarely	Frequently	Permanent

Impact area (cell sedimentation and land costs)	Sub - sector sedimentary	Cell sedimentary	Coastal water body	Transboundary effects
Magnitude	Territories affected	Material goods Affected / heritage	Biodiversity	People affected
Potential compensation	Whole	Partial	Surrogate	Null
Reversibility	Currently	Short-term	Long-term	Irreversible

Scoring is realized by summing the assigned score of each effect of examined characteristics. The system was simplified to meet the requirement of accessibility of the message SEA documents, but more accurately reflect the correct result of the application of algebraic combinations of the scores.

Minimum negative possible score is - 20, maximum positive score is + 20 pass through the point 0 in the absence of manifestation of the effect, it indicates a false case selection plan not implemented vicious consequences.

It may be noted by analyzing test scores that failure to implement the Master Plan has important negative consequences by degradation or aggravation of existing liabilities environmental problems manifested today.

Table nr.2.4 Analysis of environmental effects if Master Plan is not implemented

Relevant environmental issues	Possible future developments in the situation without implementation PNABH	Score
Shoreline restoration and protection	• Development and exploitation of certain types of investments in uncontrolled and without proper monitoring could lead to effects of changing the marine sediment transport, with direct effects on coastal erosion	-15
	- Chronic and expanding high-risk erosion areas (eg Eforie Centre) in the absence of measures to combat coastal erosion	-19
Maintaining the ecological functions of coastal waters	Hydromorphological anthropogenic influence in coastal water bodies without proper planning and a detailed analysis will lead to changes in morphology and hydrological functions with direct impact on maintaining the ecological	-20
Preserving and protecting biodiversity	• Development projects that include random unplanned protection design can significantly affect the habitats of conservation interest and protected natural areas	-15
	• Restricting investment generalized necessary rehabilitation of coastal protection structures present, as well as new ones in areas most vulnerable, can lead to damage in uncontrolled areas of greater biodiversity protection	-20
Preserving the natural	• Lack of coordinated planning at the national level which take into account the influence of climate change on coastal erosion risk can generate negative effects on protected habitats and the population in vulnerable areas	-19
Preparing for emergencies	• Failure investments necessary to protect against coastal erosion will continue to exhibit an important part of the population at risk caused by the advancing sea	-15
	• Making the necessary investments fragmented prosthetic measures against coastal erosion, may call risk unprotected population	-16
Raising awareness of environmental issues	• Lack of information and awareness, and lack of involvement in decision making, will cause people to be a factor of pressure on the environment.	-18

CHAPTER 3. The environmental significant areas likely to be affected

3.1 Geomorphological and geophysical features

3.1.1. Morphological units and sedimentary cells

3.1.1.1 Northern Unit of Romanian seaside

The main source of sediment to the coast zone is the Danube River. After construction of dams in the entire Danube basin, including the Iron Gates dam 1 (1970) and Iron Gates 2 (1983), the amount of sand brought by the Danube towards beaches reduced.For this reason, the flow of sediment brought by the Danube into the Black Sea does not exceed 40 million tonnes per year, and the sandy material (sediment entering the coastal deltaic budget) is not more than 10-12%.

Based on coastal dynamics and sedimentology studies carried out by Halcrow, we present further characterization of sediments from the Romanian coast.

General characterization of the grain surface sediments of coastal beach in front of the Danube Delta

We can identify three distinct populations with different participation of forming the sediment between Sulina and Periboina :

• Clay and silt fraction are present in low content (0.01 - 0.5%)

• sandy fraction has the largest participation with weights of 98-99% in northern and southern sectors around 50-60% and especially in the Periboina;

• fraction represented by calcareous shells and shell fragments with average sizes - large, have relatively low contents in the north (between 0.01 and 20%), but can reach over 50% on Portia and Periboina beaches. The coarser fragments can sometimes generate negative trends in the levels of asymmetry graphics. Low values are generally on the northern beaches, while the southern beaches shell content is higher.

Source of beach sands in Northern Unit

As a conclusion of coastal dynamics and sedimentology study, sedimentary deposits, we can state that the sedimentary superficial deposits of the surface on the Romanian seaside in front of the Danube Delta are deposits composed mainly of fine sand. Source sediments in this area is the Danube, through

its arms. Drastic reduction in the volume of silt carried by the Danube leads besides triggering erosion processes, the carbonate fraction weight gain, especially in the south (Port, Periboina). This increase in weight fraction carbonate (shell fragments) and entails changing pattern of cumulative curves.

The main source of fine and very fine sand in the large coastal sector Sulina - Saint George - Gates - Vadu are present Danube sediments, marine sediments as well as relics, relict deltaic, the latter being the main source of heavy mineral accumulation.

3.1.1.2 Southern Unit of Romanian Seaside *(Port Midia to the border with Bulgaria)*

Coastal unit with a chronic deficit of sediments. Danube sediments that once had been transported by longitudinal currents in the Mamaia Golf ceased to get there from extending protection from Midia port protection dams.The main sources of sediments are the shells of mollusks, sandy sediment accumulation earlier coastal erosion remobilizate rare fragments of limestone cliffs or afloreaza under the seabed and are crushed by the waves and (in small amounts and only at times) sediment that were fed artificially some beaches in decades past. Very little material or coarse sandy beaches from erosion reaches the cliffs. Southern unit is generally characterized by the presence of cells small coastal sedimentation, a sediment drift generally oriented to the south. This drift is sometimes disturbed by this dam port epiurilor, dam-break wave, etc.. The unit suffered from an intense anthropogenic impact.

General characterization of the superficial sediment granulometry between Cap Midia and Vama Veche

Granulometric characteristics of sediments from the beach of the coast littoral between Cape Midia and Vama Veche varies widely, depending on the source material and marine hydrodynamic regime.

It is observed the increased fraction in sedimentary deposits presented in organogenous sandy beach from north to south, directly proportional to the increasing distance from the Danube.

The increase from North to South along the Romanian coast of the median diameter of sand grains is due to the increase in the proportion of calcareous sand sediment structure beach. The same causes lead to an increase in the average value for the median diameters of sand grains.

Possible sources of beach sediments from Southern Unit

Northern part of Southern Unit is represented by Mamaia Golf. Here, before the construction of the dams from Midia port, the main source of sediment was the Danube, whose sediments were transported by the longitudinal currents. Following the path blocked by dams longitudinal currents at Port Midia, the main source of sediment is currently represented by shells of mollusks.

Southern part of the Southern Unit, from Constanta - South - Agigea to Vama Veche and before construction was outside the influence of the silt of the Danube port.

Superficial sediments from the beach in the southern Romanian coast are coarser than those in the northern sector. However, they are mainly medium coarse sands to granular, as opposed to the finest in the north. Exception is the transition cell - Mamaia Golf and Constanta, where there is still a significant amount of sedimentary material of Danubian origin, brought here by the longitudinal currents before the construction of the dams in Midia port. In cross section, finer sediments are placed in the backshore area, behind the shoreline, in a cast know what specific - finer in the upper, coarser in the lower - it is the swash zone. Median particle size distribution decreases towards the finer sands once with the increasing of the water depth from 3m depth for offshore field. This unit which suffers from a chronic shortage of sediment presents another feature: direct afloreazathe the limestone afloreases directly on the seabed large area from Eforie to Vama Veche, while sands are sediments and in the depressions / existing alveols limestone surface.

3.2 Chronological Changes of Sea Level

In the past there were several increases and decreases in the mean of the sea level, from the whole planet. With approximately 18000-20000 years ago, at the height of Wurm glaciations area, sea level was about 120 m below the current level. Global warming and melting glaciers have led to sea level rise, on average 1 cm per year for about 15,000 years, reaching 3-5 years ago 4000-5000 m above the present level. Gradually raising the sea level was not continuous, but consisted of a repetition of lifting and stops. Black Sea area, transgressive sea over land, which took place about 4000-5000 years ago, is known as the Neolithic transgression. Compared to the average level of the oceans, the environment of the Black Sea has undergone significant fluctuations due to climate change, probably due to its high dark environment. in a short period of time at 500-1500 years after the Neolithic transgression, sea level dropped by 5-8 m below current levels by about 3,500 years ago, this is called regression Phanagorică. Sea level continued to be low about 1,000 years. When the Greeks settled in the Black Sea ports during the first millennium before Christ, they were able to use the rock formations came out of the shallow water, in order to arrange housing port. Around the sixth century AD century it can be seen another raising of the level of the Black Sea at a rate 1 of up to 3 m, which is called Nimfean or Istrian treansgression . Sea level dropped to -1 to -2 m around the Eleventh century, then returned gradually to its present level. These lifts and decreases the average level of the Black Sea called transgressions, respectively regressions, exerted a powerful influence on coastal topography. At a depth of -14 m -12 m to the western continental shelf of the Black Sea area have been identified traces of crack-wave terraces and some relict barrier beaches, which were formed probably during times when the sea remains constant at a certain rate during the phenomenon of lift. At the rate of 3 to 5 m, along the coastal land, terraces are "Ancient Black Sea", which were formed during the Neolithic transgression.

Since the mid-nineteenth century the Black Sea countries have organized systematic observations and measurements of sea-level. There are reliable data of levels measured at Constanta since 1933, when it was installed the first seagraf in the port. Featuring the long-term levels of the Black Sea at Sulina systematically measured since 1858,it could that on the based on correlations to make a series of extensions to the series of levels in other Black Sea coastal points of observations on time intervals shorter. These expansions have led to the homogenization of the length of data series. Sea levels are regime-dependent variation of the resultant balance of incoming and outgoing water from the Black Sea basin. The variability in time and space of the components of annual and seasonal balance generates water variations and generates the volume of water that the Black Sea basin with the effects of water level variation and water exchange through straits. Variations in water balance components for the interval are felt more than 10 days. Annual and seasonal variations are representative.

Danube River has the largest share of influence on sea level variations in timp upon the Black Sea.

3.3 Environmental factors in coastal

3.3.1 Air temperature

The Climate is continental type, similar to central Europe, dry, hot summers and very cold winters. Protected shoreline area is characterized by a maritime coastal climate with an average annual temperature is 11.2 ° C and atmospheric precipitation which amounts to the 400 mm annually. Constanta area has weather typical Four Seasons, influenced by the presence of Black Sea. Annual variations in air temperature is lower than in other areas within the territory of Romania. The average temperature throughout the year is 11.3 degrees. The winters are generally mild records (predominantly positive temperature) and hot summers (average temperature of 21-22 ° C). In terms of dynamics of the coast, this stimulates the development of dune vegetation, but can facilitate transport and wind, by drying the sediment. On the other hand, wind transport is negatively influenced by humidity, relative humidity along the coast is higher than in any other region in Romania. Higher temperatures upon the land between land and sea generate breezes. For several days in a year, dunes and limit water from the beaches are freezing. During this period water erosion from the extremity of the beach and dunes is reduced, since frost ismaking the sediments more cohesive and more resistant to wind and waves. Although the rainfall in the area is low (between 383 and 531 mm / m ^{2} / year), on the coast are registered torrential rains, which may have a significant impact on the dunes and the cliffs of soft loess southern unit, which are particularly susceptible to the action of rainwater and, as such, to collapse by producing landslides. It is especially the case in the early winter period, when heavy rains coincide with winter storms, leading to joint action on the cliffs both wave and erosion subaeriene. The amount and distribution of rainfall influences the flow of the Danube. It is relevance for shoreline dynamics during the winter season is to determine the range of winter days (Tmax <0 ° C) when, except for some temporary frozens surface at noon, the beach deposits are more cohesive emeritus and resistant to wind

and wave action . Although fewer in number - 14 days / year - are more important, because they are often associated with winter storms terminal phase. In such cases, on the face of beach and ice formations arise which are designed to protect the beach against the action of waves and currents. If sea water temperature is positive and greater than that of air, beach front is maintained partly unfrozen, favoring the appearance of slopes (Scarp) to interface with the frozen backshore (Vespremeanu-Stroe and Constantinescu, 2000).

3.3.2 Rainfall and atmospheric humidity

Although the ***rainfall*** in the area is low (between 383 and 531 mm / m ^{2} / year), on the coast are registered torrential rains, which may have a significant impact on the dunes and the cliffs of soft loess from Southern unit, which are particularly susceptible to the action of rainwater and, as such, to collapse by producing landslides. It is especially the case in the early winter period, when heavy rains coincide with winter storms, leading to joint action on the cliffs both wave and erosion subaeriene. Thus, in August 2004 torrential rains caused the collapse of cliffs located northeast of Constanta and Eforie Nord. In September 2005, in Costinesti a catastrophic floods occurred, which led to the elimination of the beach. Precipitation has two points of maximum and two of minimum. Annual minimum value is recorded in March (24 mm/m2), a second peak was recorded minimum in September (28 mm / 2). Annual absolute ***humidity*** values along the Romanian coast ($\geq$ 9 g / m $^{3)}$ are with more above the average humidity values reported elsewhere in the country. More importantly it is the relative humidity, which affects coastal morphology by controlling evaporation and sediment cohesion. The averages of the relative humidity are of 86% at St.. George and 93% at Sulina. It is more important the relative humidity rules that affect coastal morphology by controlling evaporation and sediment cohesion. Relative humidity is 86% to 93% of St. George and Sulina. Because it is surrounded by large water surfaces, deltaic coast is crossed by air masses with high humidity, regardless of type of movement and direction, so it is registered the lowest seasonal amplitude: 81% August, 90% in December (St. George) . Maximum relative humidity is recorded in the morning, before sunrise, while the minimum is recorded at 12-16 noon.

3.3.3 Air pressure

A decrease in atmospheric pressure of 1 hPa results in an increase in average water level 1 cm. Study on protecting and enhancing the Southern Romanian Black Sea littoral (JICA, 2007) included the lowest pressure observed in Constanta in the 44 years between 1961 and 2004. The lowest pressure observed was 978.4 hPa, which corresponds to an increase in average water level of about 35 cm from the average barometric pressure of 1013 hPa.

Table 3.3.4.1 monthly minima at constant barometric pressure during the period studied from 1961 to 2004

	Month											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
hPa	978.9	978.8	985.4	985.6	994.4	993.1	994.9	994.9	987.5	992.9	989.8	979.4
Day	12	14	02	05	06	06	08	17	23	22	29	17
Year	1968	1962	1988	1964	1981	1994	1998	1961	1964	1974	1983	1962

3.3.4 Winds

Wind is the most important factor marine weather, while being the main source of direct power supply system by creating waves and shore currents, and relief modeling agent. The analysis of eolian wind regime of the Romanian Black Sea coast is very important in terms of the key role that storms have on coastal erosion and the highlighting of areas with high wind energy potential that can be economically exploited. Romanian Black Sea coast is a region characterized by high wind speeds (4.2 m / s - 6.95 m / s) due to the complex connections made between the paths of storms coming from the Atlantic Basin ,ciclogeneses activity in the Mediterranean Sea and atmosphere circulation of the Black Sea Bazin another reason for these high levels of wind speed is the very low surface roughness and water. Multiannual average speed (1961 - 2000) wind along the Romanian Black Sea coast has the following values: Constanta - 5.15 m / s, Mangalia - 4.2 m / s, St. George - 5.2 m / s and Sulina - 6.95 m / s. Strongest winds are recorded in winter (December to February), while summer (from July to September) the intensity is lower. As such, the beaches tend to erode during the winters, which are characterized by frequent storms, but to regenerate between April and June, when the prevailing winds from the south weaker, especially in the southern section of coast. The duration and frequency of storms are prevalent north unit (55%) (Panin, 1998). Frequency annual number of days with wind speeds exceeding 16 m / s is 10 - 25 days on the coast of the Danube Delta and 8 - 10 days on the southern coast. The highest values are registered in December-February (peak in January) and lowest values in April-September. Coastal *breeze phenomenon* is manifested due to differences in temperature between sea and land. This phenomenon is more prominent between May and September, when record high temperatures in the land. They can initiate a wind transport, given that during this period sediments on beaches and dunes are dry and, therefore, easier to train. Wind speeds recorded on the coast have resulted in a strong flow of sand over avandune. Vespremeanu-Stroe and Priestess (2007), studies on the dunes behind the beach at St. George, found the girl from the sea of dunes wind increases during low to medium intensity of land (between 5.5 and 12 m / s) and is eroded during strong winds (> 12 m / s). Breezes develop higher in the warm period of year (May to September, when the atmospheric field is characterized by high levels of horizontal gradients and there is a possibility of creating effective thermal contrasts. Day, at noon, thermal convection currents are generated on the surface continental atmospheric pressure lowering to the ground. Instead cold air at sea remains a movement which requires the destruction of descending frequency of cloud formations and a slope of isobaric surfaces to dry in the lower layer and wide in the top layer. The result is triggering breeze marine invasion during the day by the sea air and the mainland coast at night. The wind speed does not

drop at night to morning, as occurs throughout the continental surface turbulent exchange alreducerii effect, but increases with temperature gap between air land and sea. sea breeze (to large and to dry) are associated with a change in wind direction.
Also in the warm period is remarkable diurnal variation with a strong wind direction periodically. It does not consist in a simple alternation between high and dry, but in a complete rotation of wind direction (3600) in a clockwise direction. At night, between 22h - 8h prevailing breeze continental with an acceleration of speed and a deviation to the right direction to the morning (when it comes to a NS direction). Between 9 and 18 sea breeze that generally works, by evening, they reduce the speed and also are moving to the right: SE - NW. Average wind speed during the summer months (May-September) recorded at noon increased by 50% - Constanta and even 100% - St. George, which frequently surface in conditions of dry storage (due to temperature and texture) augments the potential of eolization even more as we witness a considerable increase in speed and frequency of winds from the eastern sector. In addition to eolian transport, wind plays an important role in producing waves. Waves are important especially in terms of sediment transport along this coast, taking into account that tidal amplitude and, therefore, the current intensity is low and plays a minor role in sediment transport. In conclusion, the wind is the most important climatic factor affecting decisive the Romanian Black Sea coast evolution. The dominant of the winds from the northern sector will decisively influence the transport of coastal sediment processes, forming longitudinal waves and currents and the sea level oscillations. Although in the period April to June, the winds of the southern sector are predominant, they are less intense and therefore have limited significance for coastal morphodynamic. Their impact is reduced to the level of small areas of the coast, depending on their orientation, and consist of low rates of sediment transport and shoreline changes.

3.3.5 Weather phenomenon

Of the total number of days that were recorded weather phenomena, including rainfall, the phenomena that accompanied this fact were: rain, snow, fog, hail, and blizzard . The predominantly phenomenon is rain, with an average of over 30% to coast and more than 20% of observations, in general. Snow is present up to 20% of the coast, up to 15% respectively on the high seas, concentrated in winter, especially in winter. Fog phenomenon is present throughout the year, both in general and especially the coast, less than 20% of cases, with winter predeominantã distribution in the transition. Hail was recorded in a few cases, less than 1%, but its intensity should be taken into account, is especially remarkable because the convective storms and accompanying fall in the form of aversion. Orajele are common phenomena, especially during the hot season, up to 20% of cases. Sometimes violent lightning, hit the ground and sea surface during convective storms. scarcity of strong blizzards, below 1%, this phenomenon is not negligible, because during it, when the wind exceeds 25m/sec are transported in significant amounts of snow or unfavorable sand beaches.

Visibility. The average number of foggy days is 50 days per year, the maximum is in winter, with an average of 5 days / month with a recorded maximum of 16 days / month. Fog can be quite persistent in this area, especially during winter

3.3.6 The phenomenon of freezing of the sea coast

This phenomenon is also present on the Romanian seaside Because of relatively low salinity, compared with the Planetar Ocean due to low temperatures during the winters and freshwater input by rivers in the north, the Black Sea ice is formed in western and north coast west. Environment indicates that frost occurs in January-February, on average every 5 to 7, with a duration of 24 days. Frost intensity depends on the conditions favored winter highs recorded in the years 1928-1928 and 1953-1954, when the sea froze up at the horizon and the ice was visible up to 2m thick. This can pose serious problems in coastal construction, because the ice floes trapped in structures can be deployed in the coastal sea level variation. In recent years, the phenomenon of freezing of the sea becomes more and more frequently, based on extremely low air temperatures.

january 2008 january2010

ferbuary 2011

3.4.Hydrodynamics coastal marine area: The waves and sea currents

3.4.1 Waves

By its geographical position in the western Black Sea, the littoral of the Romanian Seside is exposed to winds producing waves. Also, the phisicogeographical conditions of wide area, with over 30 m depth and mirrors free stretch of water hundreds of miles, allow the production of large waves. Under this coastal calmulatatmospheric aspect in Romanian,it is an average of about 6.7% of an.Winds producing waves have an average life time of 3 m / s. These winds have an average duration of about 82% of the year. Dominant wind direction in the Romanian coastal zone is from the north with an average annual rate of about 25.4%. Lowest frequency have winds from the south-east direction (about 5.5%). Sea wave climate is influenced both by the waves swell, and wind waves generated locally. The average speed of winds in the area is about 7.3 m / s, ranging between 8.4 m / s and 5.8 m north pedirectia / s west direction. The most intense winds occur in north and north-east direction, with speeds frequently exceeding 28 m / s to 45 m / s. On the south-east and west directions, wind speeds do not exceed 22 intense m / s. Under the action of these winds to produce wind waves and swell (left after the reduction or termination of winds) in the Romanian coastal zone. Calm state of Romanian Black Sea coastal zone is an average of about 1.9% per year, while the remaining approximately 50.7% of wind waves, swell waves and waves about 20.1% combined (wind and blasphemy), about 27.3%. A new study on simulation modeling wave was conducted by Halcrow for the Master Plan, in order to generate consistent data on the Romanian coast, waves using data from the period 1992 to 2010.

Further, the report summarized the findings of the ***Coastal Modeling:***

1. Average wave height for long-term general increase from north (0.85m) to south (0.95m) along the Romanian coast (Figure 3.6.1.1). The maximum height of waves is also higher in the south than the north coast.
2. Average wind speed is the maximum term in the central part of the coast (about 6m / s) with an average wind speed decreasing to the north (5.6m / s) and southern (5.8m / s) of the coast. A similar trend is observed for the maximum wind speeds. This could be because the panel is more exposed than other locations. The northern part is relatively less likely and will be affected by surrounding land forms.
3. Offshore wind and wave directions are variable during the year. However, there are differences in the intensity of wind and wave regime for different seasons. The quiet time of year is during the summer months of April and October, while the busy period is during the winter months between November and March. Moreover, high waves from the south are typically associated with winter season.
4. The percentage of calm periods (offshore significant wave height <0.5m) drops from about 38% in the first period (July 1992 - December 1995) to 28% in five years (January 2006 - December 2010).

This suggests a trend of increasing wave energy in the last 18.5 years. However, this data set is not long enough to allow definitive conclusions. Direction sectors with the highest extreme of large waves in the central part of the coast are between 30 - and 60°N 60 - 90°N. For these sectors, extreme wave height with a large 100-year recurrence is 7.20 m.

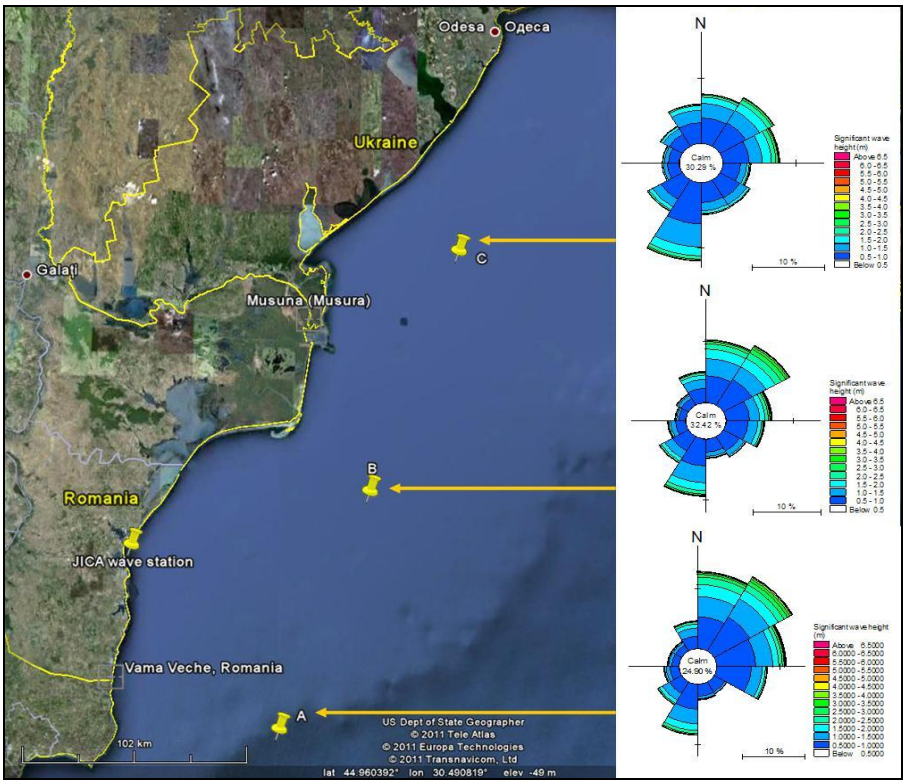


Figure 3.6.1.1 Broad wave Rosettes for Romanian seaside (Master Plan for rehabilitation and reducing the risk of erosion on the Romanian coast, Halcrow, 2011)

3.4.2 Currents

Black Sea level is affected little by the sea, so that we can say that no even the coastal currents are influenced by them. Currents on the Romanian Black Sea coast are therefore generated by the wind, the water discharged into the sea at the mouth of the Danube, the seabed morphology and near the shore by waves. That wind power drives forward friction sea surface water and puts into circulation water masses in the form of surface currents generated by wind. In turn, these currents are influenced by Earth's rotation by Coriolis acceleration, which in the Northern Hemisphere the direction deviates hourly currents (in clockwise). During calm time (with winds varities between 0 and 5 m / s) surface currents are generated by currents of the river Danube. In these conditions diffuses river currents in the

form of large freshwater Thus, the surface layer appears in a field of sea currents in the direction of south-facing drainage. River current intensity decreases as penetration into the sea from mixtures of water masses (and, implicitly, the remoteness of the mouths of the Danube), that they become practically void a few miles away from the mouth. In the area influenced by river currents in deeper water layers, forming low current clearing opposite direction of surface currents. Clearing the current regime is strongly influenced by differences in temperature and salinity during summer (May-September). Beyond the influence of river currents, during calm, there is a direct current directed towards the south at speeds of about 5-10 cm / s moving on a coastal strip distance expanded to about 20-40 km from shore . In this large strip, there is both a bottom counter much weaker than the surface, directed towards the north. Winds with speeds above 5 m / s system disrupts current, wind and currents forming regularly updated. Training time is very short wind currents (several hours), during the fighting as something larger (tens of hours). Over the continental shelf of the Black Sea coast there is an almost permanent longitudinal current, which covers a coastal strip with a width of 20 to 40 km from shore. These currents are parallel to the coast line north-south orientation, identical with the general circulation of the western Black Sea basin, and present velocity between 5 and 10cm / s. Black Sea basin shape creates two eddy currents in the west and east, and a current surrounding the Black Sea coast. Currents are also affected by the overflowing Danube River, through its three arms. Currents generated by river flood zone affects just a few kilometers from the confluence, but in these areas are formed at depths below low current in the opposite direction of surface currents. Beyond the tributaries of the Danube Delta, the currents are too weak to have a significant influence on sediment transport and therefore the erosion.

3.5.Biodiversity

Natura 2000 is richly represented in the Master Plan area of interest, therefore, in developing the Master Plan, the sensitivity of protected areas within this network is an essential element in establishing the point that subsequent work will be done to protect and rehabilitate the coastal zone, mainly based on the current state of conservation and vulnerability.

Table 3.5.1. Current state of conservation of protected natural areas of community interest

The protected area	DIVERSITY	UNIQUE	CONSERVATION STATUS	VULNERABILITY
ROSCI0066 Danube Delta - the Navy	reduced	habitats in 1130 and 1110-2, that in Romania there is only this site	good	- Oil pollution from existing oil exploitation in the vicinity of the site -Suprafishing, illegal fishing methods (bottom trawl)

				- Failure moratorium on sturgeon
Structures 0237 ROSC methane St. George	reduced	habitat in 1180, not only in this site is protected	good, very good for 1170-2	- Oil pollution from existing oil exploitation in the vicinity of the site -Suprafishing, illegal fishing methods (bottom trawl) - Failure moratorium on sturgeon
0197 ROSC submerged beach at Eforie	average	- The only place in Romania where there is sand *Donacilla* mediolitoralul *cornea* -The only place in Romania where there are bivalve *Donax trunculus* populations important , Only beach in the south coast of hydraulic structures unaffected	very good, especially for 1140-3 and 1110-3	- Construction of water likely to alter the natural sedimentary hidrodynamism and circulation - Discharges of freshwater and / or polluted marina -Intensive tourism
Cap 0273 ROSC Tuzla	high	- The only place in Romania where habitat is present sea caves 8330 - Spectacular submarine relief - One of very few places in Romania where he was present mediolitoralul natural rocky	good, especially for 1170 and 8330	- Construction of water to strengthen the already destroyed medlittoral rocky cliff in 2010 - Extraction of stone from the site for hydraulic works - Pollution from wastewater treatment plant south Eforie - Turbot fishing nets in this area is intense and constant mortality occurs among porpoises - Natura 2000 species - has exercised effective control of its
ROSC Costinesti 0293 - 23 August	high	- Spectacular submarine relief - One of very few places in Romania where natural rocky habitat now mediolitoralul Pholas	very good, especially for 1170	- Construction of water to strengthen the cliff - Extraction of stone from the site for hydraulic works

		dactylus 1170-10 with		
ROSC 0281Cap Aurora	high	-Habitat with Cystoseira barbata 1170-8, reaching the highest density here in Romania -Habitat of Arenicola and Callianassa 1110-7	very good, especially for 1170 and 1110	- Construction of water
ROSC sulphurous springs from Mangalia 0094	high	-Habitat with meadows of Zostera noltii 1110-1, unique in Romania -Habitat with Cystoseira barbata 1170-8, the site contains 90% of all the population in Romania -Habitat of Arenicola and Callianassa 1110-7	very good, especially for 1170 and 1110	- Construction of water from nature to destroy or modify existing unique habitats here
ROSC 0269 May 2 - Vama Veche	average	- One of very few places where it is present in Romania with Cystoseira barbata habitat 1170-8 - One of very few places in Romania where the Pholas dactylus present habitat from 1170 to 1110 - One of very few places in Romania where natural rock is present mediolitoralul	degraded	- Construction of water from nature to destroy the natural rocky medlittoral -Pollution -Rapid erosion in the former military Wild-tourism, including underwater

3.6.Socio-economical environment

3.6.1. Population, socio-economical data

Human resources and social issues

From the 2002 Population Census data, the following socio-economic structure of the coastal area can be established, in terms of the urban population. Thereby, 76.5% of the total urban population from Constanta and Tulcea Counties were living in the coastal area, 79.6% were the inactive population and

77.6% were the unemployed at the level of the two counties. Also, the employed population of the entire coastal area represents approximately 85.2% of the total active population. The unemployment level recorded extreme values, from 25.6% in Eforie and 12.5% in the Municipality of Constanta, and the average unemployment level in the urban environment of the coastal area was 14.8%.
According to the population distribution on the structures of economic activities, approximately 61% of the population was employed in the tertiary activity sector, this being a well represented sector of activity.

Table 3.6.1.1 Socioeconomic structure of the population Constanta and Tulcea counties by area - RPL 2002

	Active population		**Inactive population**	**Total**
	Employed population	**Unemployed**		
Constanta County	**236 068**	**45 839**	**433 244**	**715 151**
Urban	178 857	31 783	291 341	501 981
Rural	57 211	14 056	141 903	213 170
Tulcea County	**76 589**	**15 882**	**164 021**	**256 492**
Urban	45 022	7062	70 428	122 512
Rural	31 567	8820	93 593	133 980

Data source: Patz - Black Sea coastal area, section III, 2010, data from population and housing census 2002 - NIS

Over the entire coastal area, the following cities are considered to have a high percentage of the population occupied in the tertiary economic activities: the Municipality of Constanta with 71.5%, the localities Techirghiol with 70.8%, Sulina with 75.9%, Agigea with 63.1% and Costinesti with 68.5%. Moreover, at the regional and national level, the coastal zone differentiates with the high percentage of the population occupied in the service sector (61.4%). At the opposite level, the following localities have a high percentage of the population occupied in the primary sector of activities: Murighiol with 74.0% and Mihai Viteazu with 75.1%. Regarding the number of employees in the coastal area, in the period 2002 and 2008 there was a growing tendency with approximately 13.8%, a growth manifested both in the urban environment (14.1%) and also in the rural environment (9.5%). The evolution of the unemployment records for the period 2008 to 2010 reveals a growing tendency. Thus, if at the end of March 2008 a number of 7,298 persons were unemployed, in March 2010 the total number of unemployed would grow to 17,816 persons, an increase of almost 150%.

Conclusions

• There is a high percentage of occupied population in the service sector (61.4%),and a low percentage of the population working in agricultural, forestry and fisheries activities (9.6%), in comparison with the values at the national andregional level.

• The economic activities with the highest percentages of population working inare: the manufacturing industries (17%), transportation, storage,communications (15%) and commerce (14.7%).
• Over the period from 2002 until 2008 the average number of employees in the coastal area grew by approximately 13.8%.
• A growth of 1.5 times for recorded unemployed in the period of March 2002 to March 2008 was a direct result of the recent economic crisis.

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3.6.2 Features hydro

Black Sea coastal area comprises 42 territorial administrative units (ATU's), 9 units in the county of Tulcea (a joint city and 8) and 33 units in the county of Constanta (3 cities, 6 towns and 24 villages).

Water supply

Centralized water supply is made in all local administrative units, except for the commune in Tulcea County CA Rosetti, which works to achieve the water system provided by GD 577/1997 are stopped. Share in the studied units have facilities centralized drinking water supply is 97.6%. For **Constanta county,** in terms of hydro-urban facilities, shoreline adjacent to the Romanian seaside villages in northern district (commune Michael the Brave) to the south (Mangalia), are supplied with water through the interconnected system of water supply season.

Drinking water sources of Constanta are:
- Source area: Canal Gate Alba - Midia Navodari, km 6 396 at Galesu.
- Underground sources:
- Caragea Dermen source - located on the right side of the DN 2A - E60 from Constanta, Ovidiu villages with a total of 19 wells drilled;
- Source fountain I - located in the northern city of Constanta, has a total of 34 wells in operation (2011);
- Source fountain II - located on the left side of the road DN 2A - E60, between cities of Constanta and Ovid, with a total of 12 wells drilled. Of which 3 are disabled;
- Northern constant source - located in the complex storage - pumping Constanta North, located north of Constanta, on the shores of Lake Siutghiol southeast. Source has 5 wells drilled (2 up and 3 in conservation, 2011).

Number of inhabitants connected to the drinking water supply network is 290,465 inhabitants.
The city water supply is provided by underground sources **Mangalia:**
- Source Cotu Valley, located in the western town Vartop. Source has 3 wells drilled, of which 2 are in operation (2011);
- Source Vartop I - amplaasata in town Albesti NV, has 5 wells drilled;
- Source Vartop II - has a well drilled;

- Albesti source - located in south - east of town Albesti, has 19 wells currently in operation;
- Pecineaga source - located on the left side of DJ-Pecineaga Dulcesti 394, 8 wells in operation;
- Source Dulcesti - situated on the valley, on the east side of town Dulcesti, with 11 wells drilled in operation;
- Tatlageac source - located in the intersection of DN 39 Constanta - Mangalia, 5 wells drilled in operation.

Number of inhabitants connected to the drinking water supply network is 39 256 inhabitants.

Wastewater Disposal

Sewage water treatment is not achieved in all localities where water is the central facility.

Regarding the sewer system and wastewater treatment of **Constanta** is a mixed system, divided and whole, collecting both domestic wastewater, and storm water and industrial preepurate. The total length of sewerage network in the city of Constanta is 625.6 km.

Constanta has two mechanical-biological treatment plants: Constanta Constanta South and North, evacuated treated wastewater into the Black Sea. Maximum daily volume discharged: 442.358 m³ / day.

Sewerage system and wastewater treatment serves both the city of **Mangalia** Mangalia and resorts in the Neptun, Olimp, Jupiter, Venus, and Saturn Aurora. The total length of sewerage network is 180.4 km.

Municipiun Mangalia has a biological treatment plant located on Lake Mangalia, 200 m from the lake and about 200 m from the Black Sea. Maximum daily volume discharged: 77 760 cubic meters / day.

Sewerage system and wastewater treatment **and Navodari Ovidiu** serves the two towns, discharge treated wastewater from biological treatment station Ovidiu Ovidiu achieved in the lake. Maximum daily volume discharged: 2592 m / day.

The total length of sewerage network is 64.6 km (26.9 km and 37.7 km Ovidiu Navodari).

Sewerage system and wastewater treatment Eforie Nord **Eforie** serves cities, Eforie Sud, Costinesti, Schitu, Tuzla, and Agigea Techirghiol, with a total length of 139.7 km of the network. Authorized receiver is the Black Sea water treatment and maximum daily volume is 113,799 evacuated cm / day.

Sewerage system and wastewater treatment and Mangalia Shipyard **Limanu** serving area and the related housing is equipped with a biological treatment plant. Wastewater discharge is made in the Black Sea and the volume is up to Vilna in 1304 cubic meters / day.

Bathing water in landscaped natural areas

At the European level have been developed in the bathing water a number of legislative instruments represented by Directive 76/160/EEC on bathing water quality (bathing Water Directive) and Directive 2006/7/EC concerning the management of bathing water quality (Directive Concerning the management of bathing water quality and repealing Directive 76/160/EEC), aiming to ensure proper quality of bathing waters for the conservation and environmental protection and public health protection in the Member States.

The provisions of these Directives have been transposed into Romanian legislation by:

· GD 459/2002 regarding the approval of water quality in natural areas set aside for bathing
· GD 88/2004 for approval of surveillance, health inspection and control of natural areas used for bathing
· GD 546/2008 on the management of bathing water quality, modified and supplemented
According to GD 546/2008 on the management of bathing water quality, modified and completed, the Ministry of Health - by Constanta County Department of Public Health and the National Administration "Romanian Waters" - the Administration Dobrogea-Litoral Water basin, annually identify all waters bathing, until May 15.
Bathing areas are monitored and evaluated in terms of water quality by Constanta County Public Health Department.
In the summer 2010 bathing waters were monitored chemically and bacteriologically, for 12 weeks. Bathing waters in the Romanian seaside resorts have water placed in categories "good" and "very good".
Bathing areas for summer 2011, according to HG 546/2008 established the management of bathing water quality are presented below.
Table 3.6.1.3 List of the bathing season proposed for 2011, according to GD 546/2008 on the management of bathing water quality, as amended and supplemented

No. CRT.	County	Locality	Bathing area	Water quality monitoring point
1.	Tulcea	Jurilovca	Holiday village Gura Portita	North Beach
				South Beach
2.	Constanta	Navodari	Navodari I	Dolphin Camp
3.			Navodari II	Pirates Inn
4.			Navodari III Zone I	Camping Marina surf
5.			Navodari III Zone II	Majestic Pearl
6.			Navodari IV Zone I	Stop III Mamaia
7.			Navodari IV Zone II	Camping fishing
8.		Mamaia	Mamaia I Zone 1	Tourist Camp
9.			Mamaia I Zone 2	Enigma
10.			Mommy	Summery
11.			Mamaia III	Vega
12.			Mamaia IV	Rex
13.			Mamaia V	Castle
14.			Mamaia VI	Casino
15.			Mamaia VII	Pearl
16.			Mamaia VIII	Aurora
17.		Constanta	Constanta I	Dolphinarium
18.			Constanta II	Modern
19.		Eforie Nord	Eforie Nord I	Wharf

20.			**Eforie Nord II**	**Belona**
21.			**Eforie Nord-Eforie Sud Cordon I**	**Azure**
22.			**Eforie Nord-Eforie Sud Cord II**	**Camp Eforie Sud**
23.		**Eforie Sud**	**Eforie Sud I**	**Splendid beach**
24.			**Eforie Sud II**	**Casino**
25.		**Costinesti**	**Costinesti I**	**Fishery**
26.			**Costinesti II**	**Forum**
27.		**Olympus**	**Olympus I**	**Fishery**
28.			**Olympus II - 1**	**Pool Oltenia**
29.			**Olympus II - 2**	**Area Protocol**
30.		**Neptune**	**Neptune I**	**Breeze Terrace**
31.			**Neptune II**	**Neptune II**
32.		**Jupiter**	**Jupiter 1**	**Dolphin Brasserie**
33.			**Jupiter 2**	**Comet Complex**
34.			**Jupiter 3**	**Hotel Capitol**
35.			**Jupiter 4**	**Hotel California**
36.		**Cap Aurora**	**Cap Aurora 1**	**Hotel Opal**
37.			**Cap Aurora 2**	**Hotel Onix**
38.			**Cap Aurora 3**	**Fish restaurant**
39.		**Venus**	**Venus I - 1**	**Calypso Restaurant**
40.			**Venus I - 2**	**Hotel Aphrodite**
41.			**Venus II**	**Hotel Silvia**
42.			**Venus**	**Pearl Venus**
43.			**Cord Venus - Saturn 1**	**Adriana Buffet**
44.			**Cord Venus - Saturn 2**	**Actetis**
45.		**Saturn**	**Saturn I**	**Adras**
46.			**Saturn II**	**Diana Beach**
47.		**Mangalia**	**Mangalia**	**Mangalia**
48.		**May 2**	**May 2**	**May 2**
49.		**Vama Veche**	**Vama - Veche**	**Vama - Veche**

3.6.3. Economic sectors

Fishing. The coastal area of Romania, one of the activities is the oldest fishing. This activity is carried out mainly in the northern half of the Romanian coast, where fishing is concentrated sturgeon and shad, in the southern small-scale fishing prevails, because populations of rocky bottoms guvizi area.

In the coastal area of the Romanian seaside, fishing takes place in three ways: with fixed gear (in Agigea, Eforie Nord, Eforie Sud, Tuzla, Costinesti, 23 August, Mangalia), with mobile tools (fishing vessels) and fishing crafts made by local fishing communities. In Romania, static and mobile fishing takes place along the Romanian coast and marine areas to the isobath of 60 m, due to limited autonomy characteristics and fishing vessels. Fishing trawler boats is seasonal, depending on the presence of fish in these areas. An important fishing area is the area of the Danube Delta Biosphere Reserve Marine, but is prohibited activities Trawler ships. Beyond, the rest of the Romanian seaside, to the 20 m isobath is also forbidden to work vessels using towed gear, fishing is permitted only with stationary tools and surrounding filter (net). Predominant species captured in the Black Sea are small: sprat (73.39%), anchovy (7.60%), guvid (4.67%) şibacaliarul (4.55%), fishing is from March to October.

Fishing stationary

Fishing stationary (passive) is practiced along the Romanian Black Sea coast, between points Sulina and Vama Veche, in the shallow sea. Fishing is done in two ways:
- *Commercial fishing industry practiced* by private companies or organizations, professional producers of fish;
- *Fishing craft*, practiced by individuals, members or nonmembers of the Association General Hunters and Anglers, fishing or on an Amateur;
In 2010, the Romanian marine sector, commercial fishing was done in two ways: active fishing gear, coastal trawler ships carried out at depths greater than 20 m, and fishing with fixed gear, practiced along the coast, 20 points fishery, located between the Sulina - Vama Veche, shallow (3-11 m).

Evolution of state indicators:

- **stock biomass** for the main fish species (Table 3.8.3.1.1.) indicates:

- The ***sprat,*** which usually presented a natural fluctuation, almost normal and actually quite good, biomass is estimated at 60,000 tons, as in the past four years, from 45,000 tons / 2005 tons and 14 750 / 2006 when, the existence of special hidroclimatice conditions, the species was stuck in other areas of the sea;
- To ***bacaliar,*** biomass was estimated at 11,000 tons, with about 15% higher than estimates last year when he oscillated between 6000 and 8500 tons (2004-2008);
- The ***turbot,*** biomass was estimated at about 1,300 tons, a value lower than 2008 and close to that of 2007;
- The **shark** biomass was 2,500 tons higher compared with that of 2008 but lower than 2007 (4.300 tons)

- **population structure** indicates, as in previous years, the presence in capture a greater number of species (over 20) of which were so basic small species (sprat, anchovy, bacaliar, guvizi) and the higher class (Turbot and shad). The percentage of species of small shark, mackerel, garfish,

mullet and blue fish, and recurrence as isolated specimens of blue mackerel (mackerel) and Atlantic bonito.

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Species	2005	2006	2007	2008	2009	2010
sprat	45.000	14.750	60.000	60.000	60.000	60.000
Bacaliar	8000	7000	6000	8500	10.000	11.000
Anchovy	19.000	20.000	20.000	20.000	-	-
Guvizi	600	600	600	500	-	500
Turbot	1080	1150	1300	2356	1500	1350
shark	1650	2000	4300	1.4050	2500	2500

Table 3.6.3.1.1. Value stocks (tonnes) for the main fish species in the Romanian Black Sea
Source: Report on the state of marine and coastal environment in 2010, Grigore Antipa INCDM

Continuing **effort** to reduce the tendency reported since 2000. Thus, in 2010, actively fishing, sprat specialized species (pelagic trawl), worked only one ship, and the turbot 114 boats (6-12 m). In fishing with fixed gear, practiced over the Romanian seaside, were used: seines 20, 3691 turbot nets, gill nets for herring 1422, 41 gill of guvizi, 8 beach seine, gill of mullet 187 / Laban, 171 shark nets, 27 gill of horse, 202 lines and 264 volts;

● **the total catch** reduction trend continues, reported in 2000, from 2,000 t in 2001-2002 to 1390-1940 tons, 500 tons in 2003-2006 and in the last four years (2007-2010) and 435 t / 2007, 444 t / 2008, 331 t / 2009 and 258 t / 2010. The low level of catches in 2010 and 258 tons, was mainly due to reduction of fishing effort (decreased number of coastal trawlers, the number of seines and therefore the staff engaged in fishing) and the influence of the populations hidroclimatice fish and increase production costs and lack of market outlets.

Industrial activites and services

Energy industry based on exploitation of oil in the Black Sea coastal platform and brought oil imports (in Constanta, Midia) broad-area petrochemical platform Midia-Navodari, which produce various derivatives obtained from petroleum. Constanta, Ploiesti oil pipeline, built in the interwar period for export of crude oil is currently used for transport in the opposite direction of quantities of crude oil imported.

For electricity, heat, gas and water, they work in urban areas in Constanta, Mangalia and Navodari city, representing 3% of the total industrial units examined. Power plants are located in Dobrogea Ovidiu, Constanta Navodari and being interconnected national power system.

Petrochemical industry provides annual production of over 4 million tons of crude oil and petroleum products to obtain fuel, aromatic hydrocarbons, liquefied gas, coke, oil and other sulfides. This industry is represented locally by Rompetrol Refinery. Drilling offshore center, located in the territorial waters of the Black Sea, Petrom SA Bucharest Constanta branch PETROMAR combines operating activities

(drilling) of crude oil and natural gas production activity thereof. Exploitation of deposits of the Black Sea continental shelf approx. 10% of national oil production.

Machine building industry produces ships (in Constanta and Mangalia), agricultural (Medgidia Navodari), various metal constructions (Constanta, Medgidia, Bessarabia). It is distinguished by size and production Constanta Shipyard, which builds ships (ore) up to 160,000 dwt. Regarding the car industry, representative for the area are Navodati Legmans companies. These companies are producing agricultural machines and equipment such as trailers, combine for sowing, planting bulbs and harvesting machinery, balers, presses for excavators, spare parts, the weeding hoes, harrows, etc. The study area is relatively wide range of extract building stone: limestone (Mihail Kogalniceanu - near Tulcea, Ovid, Medgidia, Bessarabia, etc..) Diatomite (Adamclisi), chalk (at Mission). Near Constanta, Great Palazu there are also iron resources, but due to reservoir conditions, there can still be exploited.

Construction materials industry produces binders (Medgidia), cement (Medgidia, 23 August), lime and plaster (at Medgidia, Constanta, Jurilovca and Năvodari), precast concrete (in Constanta, Ovidiu and Mangalia). Building materials supply industry provides specific requirements of: cement, prefabricated, composite stone tiles, polyester resins, kaolin, limestone, bituminous products.

Wood processing industry is represented in Constanta (veneer, chipboard, plywood, furniture) and in smaller centers (Navodari, Mangalia, Medgidia Limanu). Wood processing industry produces a wide variety of furniture for home, garden and office. Countries which exports are France, Holland, Germany, Canada and Italy. Wool *textile* processes (Constanta), cotton (Mission, Medgidia), hemp (Constanta and Mangalia) and produces garments (Constanta, Medgidia, Mangalia, Techirghiol). *Light industry* study area produce clothing for men, women and children, industrial equipment work, linen, knitwear, jute and polypropylene bags. The products are mainly distributed on the external market (approx. 70%). Production of clothing is made especially to order lohn system, in collaboration with foreign companies. Countries where exports are the Netherlands, Italy, Spain, France, Belgium, USA, Cyprus, United Kingdom. Includes milling and bakery *food* (Constanta, Medgidia, Eforie, Mereni, Negru Voda), sugar industry (and Navodari Constanta), oil (Ceamurlia de Jos, Nicolae Balcescu, Bags, Eforie, Constanta), canned fish (Medgidia Constanta), Ovidiu fruit), dairy industry (Constanta, Mihail Kogalniceanu, Valu lui Traian), beer (Constanta) and wine (Murfatlar Nucarilor Valley, 23 August). Another important sector of the economy in the coastal area is *civil engineering and industrial* economic activity as represented by:

• hydraulic structures, public utilities, civil engineering works;
• Irrigation and repair works;
• Repair work for railways, roads, bridges and airports;
• port equipment necessary for the entire infrastructure of the ports of Constanta, Mangalia and Midia and Agigea and Navodari locks.

Service activity concentrates the largest number of firms (78%) and highest number of employees (65%) in the coastal area studied. Trade is an important economic activity for the area studied, is the third most common economic activities. Therefore, in this sector, 10.5% are SMEs, 89% micro-enterprises and large enterprises 0.5%.

Aspects of Tourism. Romanian shore coastal area, covering a territory rich in tourist resources, both in terms of natural and anthropogenic, Danube Delta Reserve, designated as heritage together in 1991, is one of the most important tourist areas in the country.

Danube Delta tourism endowed with natural and anthropogenic resources can satisfy the various forms of tourism to the requirements different in spring and autumn.
Tourism potential of the delta between the valences of mention: the value of landscape, aesthetic and recreational qualities of natural factors including bioclimate course, the existence of conditions that generates specific forms of tourism - and reed lake complex that specific resources, the presence of specific elements that have contributed the declaration of the delta as a biosphere reserve.
Relief deltaic area is distinguished by the sand dunes on the banks Letea, Caraorman Sărăturile and vegetation and fauna associated with increasing complexity and aesthetic and scientific value, beautiful sandy beaches of the Sulina, Saint George, Gura Portiţei valued by spa tourism, helio cure physical support.
Dense network of branches, streams, canals, lakes and ponds provide opportunities for practice excursions, nautical tourism, sport fishing because the fish wealth. Salty waters of the Black Sea and Lake Tuzla are wedding guests and cleaning by natural factors generating aerosols emitted health tourism.
Bioclimate delta and coastal environment created for tourism activities (number of sunny days a year long sunshine, high temperature, low temperature quantitatively) and is an important factor for natural prophylactic treatment.
Moderate level of natural ions, positive ions results in a particularly mild microclimate aeroelectric applicant for the body. Places suitable for this form of tourism: Sulina, Sfintu George, perishable-Port.

Specific vegetation gives a great aesthetic value and ecological landscape: many species with unusual shapes (oaks, cork, lianas), large reeds, compact, floating islands plaur is a natural tourist resource that generates strong motivation for leisure travel and scientific tourism.

Delta fauna consists of a wide variety of aquatic and terrestrial species, sedentary or migratory bird species established itself; ichthyofauna sport fishing generates tourism and all other wildlife species of interest to tourism-specialized scientific biologists,

botanists, ornithologists, ichthyology.

The main tourist areas specific of delta area are:

1. Rossetti CA Area, with accommodation in Sulina and rural exsitente;

2. Touristic Gorgova-Uzlina Area

3. Red-Puiu Tourist Area

4. Razim-Dranov Tourist Area, with tourist complex Murighiol, Jurilovca and camping Portita.

5. Wolves-Chituc Grindul Tourist Area

6. Beaches of the seaside tourist area Sulina, St George probe channel, Chituc, Portita.

Romanian coast presents a wide variety of natural attractions, offering opportunities to make helio cure, treatment, medical spa, water sports, scientific cerctari and, of course, recreation.

Romanian seaside beach is being housed at the coast between Constanta and Mangalia sector or the rest has a large coastline descidere unlike most European beaches. Romanian Beach has a predominantly eastern orientation which leads to its exposure to the sun throughout the summer day about 10 hours a day. The beach is generally natural quartz sand, limestone formed dn, with a fine to medium grain. Width varies between 400-500 m beach at Mamaia and only 50-200 m in the rest of the coast.

Low salinity sea water by 17 to 18 g / l, and chemical composition (chloride, sulphate, sodium, magneică) is favorable in terms of therapeutic body and by the action of waves and the presence of aerosols from the waves breaking on shore is an element of natural tourist generating another form of treatment - thalasoterapia. The lack of tidal and wave ensure optimal use of beaches, while the lower salinity surface water and underwater sports favors the water.

CHAPTER 4. Other existing environmental problems which are relevant for the Master Plan, especially related of the existence particular importance areas for environment such as protected natural areas

4.1 Coastal Zone

The Black Sea Romanian coast is divided into two units, *drive north* from the Danube Delta Razim-Sinoe Lagoon, with a length of about 165 km and *the south,* from Cape Midia to Vama Veche the approximate length of 82 km. Its topography consists of low altitude shores, beaches (80%) and relatively high shores, cliffs (20%). Typological point of view, includes both natural coastline (beaches and cliffs - about 84%) and shore "built" about 16% (ports, protective hydraulic structures).

Northern Unit is part of the Romanian seaside Danube Delta Biosphere Reserve Administration (DDBRA) area with great biological diversity, the largest deltaic area in Europe. *Southern* Unit of the Romanian Black Sea Coast between Midia and Vama Veche, is divided into seven sectors.

While the northern unit is for nature conservation unit, the southern unit has been developed for port activities, housing, industry and tourism. In particular, bathing and sunbathing are the most common, not only for Romanian, but also other Europeans.

Coastal Zones are generally fragile ecological speaking. This is determined by natural factors that are affected by high-impact activities on the environment. Ecologically fragile areas are areas whose dynamic in time and space is or may be adversely affected by a number of factors sensitizers (natural or anthropogenic).

Coastal areas are subunits of the continental margin located between the lower limit of continental plateaus (200-300 m) and self continental edge (-150 - 200 m) represented at the contact areas of marine and terrestrial system, characterized by a dynamic very active.

Fragility of coastal zones is given by :

- The aquatic environment has a limited potential for self-cleaning;
- It is an attraction for many human activities, especially for the transport (high-risk, especially when it comes to oil or hazardous chemical substances), industrial and fishing;
- Presents a significant dynamics imposed by abrasion coast, sea level rise and shoreline features;
- Biotic environment is very sensitive;
- Climate risks, which constitute a risk factor for human activities (especially for the port) have a high frequency;
- Dynamics is influenced by the state of ecosystems and human activities in a very wide area;
- Presents very high vulnerability to global changes.

4.2. Special Protection Areas

Area development plan of the coastal zone includes almost all the Romanian seaside, from Vama Veche to Sulina, focusing particularly on the implementation of shore protection works by dams and epiurs, beach expansion and installation of structures such as submerged artificial reefs to reduce force waves reaching the beach.

Because the work extent, the structure of coastline will undergo changes, sometimes substantial changes that will target not only shore shore emersion but submerged. Especially in areas in the tourist resorts, is considering extensive sanding work that will lead to widening the beaches with up to 6-10 m for large, but works that will change the structure of the seabed in these areas.

Because all the Danube Delta is included in the ROSPA 0031 Denube Detla and Razim-Sinoe Complex , and the whole Black Sea coast is included in ROSPA0076 Black Sea and the coastal zone

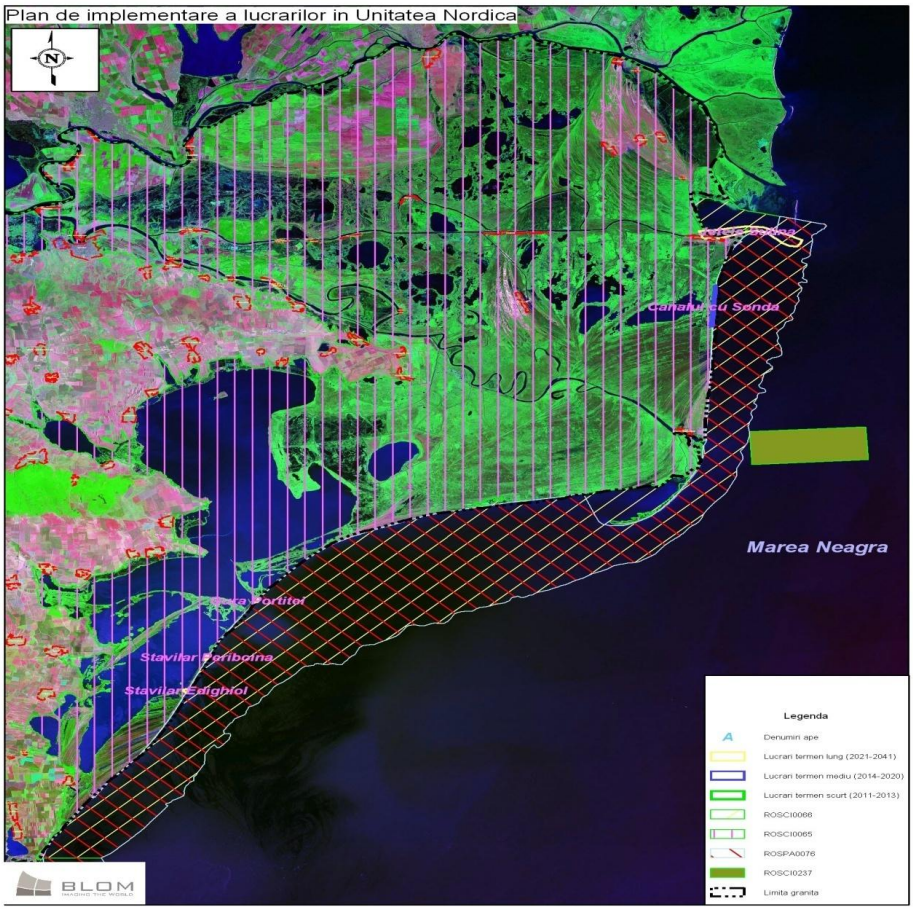
because there are a number of protected areas of interest included in Natura 2000 - ROSCI0065 Delta, Delta ROSCI0066 - the navy, marine structures methane ROSCI0237 Saint George, submerged beach ROSCI0197 Eforie Nord - Eforie Sud, ROSCI0273 marine area from Cape Tuzla, sulphurous springs ROSCI0094 submarines from Mangalia, Vama Veche ROSCI0269 - May 2, ROSCI0293 Costinesti - 23 August, ROSCI0281Cap Aurora, ROSPA0057 Lake Siutghiol ROSCI0073 marine dunes from Agigea ROSCI0114 Swamp stud - Oban Great Cave mound, ROSPA0066 Limanu - Stud (areas covered by EU environmental legislation to which Romania joined by ratifying the Convention on Biological Diversity Conservation), required detailed analysis of the effects that these works will have on marine biota in those areas.

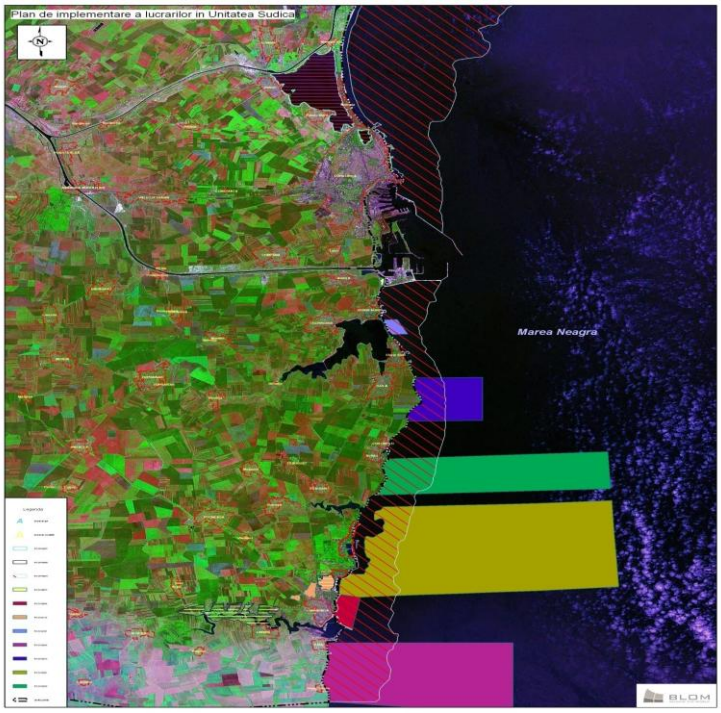
Site of Special Bird Protection ROSPA0031 Danube Detla and Razim-Sinoe Complex and face a series of negative issues regarding the conservation of fauna, namely:

- Intensification of agriculture - farming methods change from the traditional intensive agriculture, with large monocultures, excessive use of chemicals, carrying out works only with equipment and machinery - semi-natural habitat change (hay, pasture) due to the cessation of agricultural activities as mowing or grazing - poaching - the sewage draining wetlands along rivers on lowland areas, inturbarii - mowing during the nesting period - industrialization and urban expansion;
- Destruction of nests, or offspring or ponts- disturbing birds during the nesting period (colonies) - burning of vegetation (stubble and the areas set aside) - setting the course of rivers - electric power lines and collisions - mass tourism - location of wind generators;

Uncontrolled invasive species - deforestation, logging and forestry works which result in cutting trees over large areas - selective logging of trees older adults or species-gathering fire wood, - afforestation of semi-natural areas (pastures, etc. fanatic.) - drainage of wetlands through drainage along the river, the plain-regulating areas of river courses - burning reed inperioada nesting location of wind generators - Navigation.

Coastal and littoral area from Midia Cape to Vama Veche, included in 0076 ROSPA Black Sea, is under pressure of anthropogenic factors with major impact on coastal and marine ecosystems by port activities, shipping, commercial fishing, major urban areas and resorts travel, tourism and water sports, industrial, etc.


Plan de implementare a lucrarilor in Unitatea Nordica
Canalul cu Sonda
Marea Neagra
Stavilar Peribolna
Stavilar Eslighiol
Legenda
Denumiri ape
Lucrari termen lung (2021-2041)
Lucrari termen mediu (2014-2020)
Lucrari termen scurt (2011-2013)
ROSCI0066
ROSCI0065
ROSPA0076
ROSCI0237
Limita granita



4.3 Changing shoreline / coastal erosion

"Diagnosis of the Coastal Zone Report" Hallcrow 2011, shows changes in time of each unit cell sedimentation both in the northern Romanian coast, and from the south.

In the summary there are the main historical changes of the coastline that took place along the coast:

North Unit is a deltaic coast, with a length of 93km, subject to erosion, especially in the last five decades. Sectors are retired (55.6%) of coastline, while the sectors and the steady advance spread over a ~ 48km (29.6%), respectively, ~ 24km (14.8%) of coastline.

Danube River is the main source of sediment in littoral drift system of the northern unit. River Danube and its main tributaries were baratisi Dike far ahead in many locations - including the Iron Gates I dam in 1970 and Iron Gates II in 1983. Following these changes artificial basin and the Danube Delta, supplying sand beaches of the river decreased significantly. Flow of silt brought by the Danube into the Black Sea is below 40 million t / year, of which only 10-12% or less is sandy material, which is a source of sediment for the littoral zone of the delta front, the rest being composed of materials Finally.

The coastline of cliffs dominated the Southern Unit, between Cape Midia and Vama Veche was, in contrast, highly influenced by anthropogenic intervention. This numerous dams built since 1980, has led to fluctuations in shoreline position, as these structures caused by accumulation of deposits localized formation, observed in previous periods.

Development of three ports (Constanta, Midia and Mangalia) resulted also a major change in sediment drift along the coast. Since 1980 there has been an increase in erosion rates, compared with previous periods. The only sector is characterized by accumulation Midia, though even here rates were slightly lower since 1980 (about 2m/an).

Power projects from the southern beaches of Mamaia barrier was effective only for short periods of time. Erosion was more pronounced in northern and central barrier after 1980 (values over 2m/an).

Eforie barrier was characterized by 2m/an erosion rates, with higher values along the southern extremity. Erosion rates somewhat lower (under 2m/an) were recorded on shore resort Neptun. The highest erosion rates are registered in the Mangalia, large dam south of VI-J-23, with rates of over 4m/an.

Coast Vama Veche - May 2 was a line of accumulation, however, during 1960-1980, due to the effect of southern breakwater of the port of Mangalia on sedimentary input, this section of coast has become one of erosion, with erosion rates of about 3 - 4m/an.

In short, the key factors that caused increased erosion since 1980 are:

• The frequency and variability, on decade scale, marine storms. The number and intensity of storms were higher during 1970-1980 but decreased since then. This explains the lower deltaic coastal erosion rates.

• Reduce intake of sediment due to construction of dams in the Danube Basin.

• Coastal structures in the direction of movement caused erosion coast (Sulina coast - St. George suffers from erosion due to dam Sulina) and a phenomenon of accumulation in the opposite direction littoral drift.

CHAPTER 5. Environmental protection objectives relevant to the plan

Selection of environmental objectives has been achieved after completing the analysis described in the chapters on environmental issues and possible developments for the Master Plan is not implemented and considered the following criteria:

- Geographic Area Master Plan analyzed under evaluation
- Master Plan is a strategic document
- The information must be collected only in the quantity and level of detail required for accurate decision.

No. CRT	Environmental aspects	Environmental objectives relevant to plan
A	Shoreline restoration and maintenance	OM1. Implement a sustainable coastal zone management in terms of environment and equitable economic
		OM2. Prevent further degradation of land and conservation of their functions
2	Conservation of biodiversity at ecosystem (Habitat) and the specific level (endangered species)	OM3. Conservation of biological diversity and growth by reducing the negative impacts and the ecological reconstruction of damaged ecosystems and habitats
3	Rising sea levels, temperature, salinity and modify the specific composition of the fauna and flora	OM4. Compliance obligations assumed by Romania to achieve targets' 20-20 -20 "EU
4	Maintaining the ecological functions of coastal waters	OM5. Prevent or limit damage to the quality of coastal waters bodies
5	Improving living conditions impact on human health	OM6. Preventing and minimizing risk population and human communities exposed
6	Preserving the natural	OM7. Protection and improvement of natural landscape conservation or aesthetic appearance.
7	Cultural heritage	OM8. In situ protection and conservation of monuments and historic property, preservation of local traditions and customs.
8	Public awareness on the issue of coastal erosion	OM9. Active involvement of communities in decision-making process through SEA
9	Material values	OM10.Prevenirea or minimize economic losses by reducing coastal erosion risk

CHAPTER 6. Potential significant environmental effects

6.1. The impact assessment methodology

In environmental impact assessments will use the criteria listed in Annex 1 to *Government Decision no. 1076/2004 on the establishment procedure of environmental assessment for plans and programs* and will take into account the initial conditions of the environment, malfunctioning hearing date, the sensitive areas of environmental objectives relevant to the plan, etc..

The usefulness and effectiveness of the SEA as a procedure is demonstrated by balancing development options proposed in the plans or programs recognized by the general objective of ensuring sustainable development concept includes environmental and human health.

This consideration was at the basis for impact assessment methodology as a tool for developers to check even the Master Plan and for other stakeholders.

SEA addresses the issues proposed by the documents with director character, with a low degree of detail, which is why SEA specific analysis starts from the general conditions, general conditions set as targets subordinate global objectives, national, local or area - if this Master Plan .

The methodology used was the criterion for Impact Assessment devoted to developments resulting from the application of measures established by the Master Plan.

Thus, we aimed to analyze the existing conditions of such major developments proposed types of emissions generated potential environmental issues / vulnerabilities environmental quality targets impact assessed for all general development / measures proposed in the Master Plan.

Also, when assessing environmental impact of individual factors we take into account the event of application of mitigation measures of the impact that will be presented in chapter 8.

Environmental impact was assessed in terms of the type of impact, the extension in time and space, the possibility of mitigation and monitoring, as shown in Table 6.1.1. Classification of the elements of assessment is as follows:

- Type of impact - direct, indirect and cumulative
- Reversibility of the impact - impact currently and reversible (M), reversible long time, irreversible
- Extend time - during construction and after construction
- Spatial extent - and local scale

- Possible mitigation - total and partial
- Possibility of monitoring total and partial

Table 6.1.1-parameter analysis of environmental impact

No. CRT.	Environmental Impact Element	Type of impact		Reversibility		Extension time		Extend the			The possibility to reduce		The possibility of monitoring	
		Directly	Indirectly	reversible	irreversible	Cumulative	during construction	After construction	Large-scale	At the local scale	Total	Partial	Total	Partial
A	Incorrect distribution of benefits and damages		X		X	X		X		X		X		X
2	Cultural heritage	X			X		X			X		X	X	
3	Local conflict of interest			M		X		X		X		X		X
4	Water use and water rights or rights-established	X			X		X			X		X	X	
5	Coastal areas (mangroves, coral reefs, tidal land, etc.).		X		X	X		X	X			X		X
6	Flora, fauna and biodiversity	X			X	X	X	X	X	X		X		X
7	Landscape	X			X			X		X		X	X	
8	Pollution	X			X		X			X	X		X	
9	Water Pollution	X			X		X			X	X		X	
10	Noise and vibration	X		M	X		X			X		X	X	
11	Bottom sediments	X			X		X			X	X			X

6.2 The impact on the environment air

In terms of the probability of air pollution as a result of implementing the Master Plan proposals to be considered primarily economic and social development facilities in the area attracted such analysis plan to increase in traffic, enhance the navigation, promoting tourism, investment and industrial type services.

In this context in areas where levels of sulfur dioxide, nitrogen dioxide, PM10, PM2, 5, lead, benzene and carbon monoxide in ambient air are below the limit values specified by the legislation will maintain the same target as air by adopting general measures to limit air pollution established by the Master Plan.

Development measures established by the Master Plan will integrate air quality requirements stipulated in Directive 2008/50/EC on ambient air quality and cleaner air for Europe and will coordinate with the Local Plan for air quality management. If the levels are set more stringent air quality through local plans, Master Plan will take these conditionings.

To assess the impact of values is considered a scale from -1 to 5, representing:

5 Positive impact / major negative, cumulative, irreversible

4.Positive impact / negative major irreversible

3Positive impact/ negative medium term, reversible

2.Positive Impact / negative medium term, reversible

1.Positive Impact / negative cut, currently, reversible

No impact .

Assessment will be done for each of the four major variants

For future development of investment projects arising from this Master Plan proposals will apply mandatory EIA, during which it will identify and quantify the impact of investment, establishing measures to limit emissions.

The *emission of pollutants* means, according to Order 462/93, "the elimination of pollutants in the atmosphere of solid, liquid or gaseous or surface from point sources."

According to the same legislation, rules to limit emissions is preventive: rules on maximum concentrations of pollutants allowed to be released into the atmosphere by various anthropogenic activities ", and *toxic"* pollutants in the air transfer to a receiver "(the man and his system factors environmental, material goods, etc.).

For the area covered by this study, emissions may come from:

- *The construction phase*

- *After the finalization of the works*

a) Impact on the environment air during execution

The main pollutants are released into the atmosphere during the period of construction throght carbon monoxide, lead, nitrogen oxide, dust, carbon dioxide and hydrocarbons.

For sanding Mamaia Beach with sand from the Danube, was proposed alternative transportation by barge on the Danube - Black Sea Channel and the Poarta Alba - Midia Navodari and then transport it by truck to sites for redevelopment. Combined variants vessel traffic - traffic will be presented in Chapter 9.The choice of the variants.

Air pollution resulting from motor vehiclescirculation is characterized mainly by emission of gaseous and particulate pollutants - *carbon monoxide, nitrogen oxides, volatile hydrocarbons, light powder containing heavy metals* and *sulfur compounds*, and calculate the amount of pollutants can be determined based on certain models the calculation. In addition, the dust emitted into the atmosphere during handling activities of the sand, rough stone warehouses and during transport and their disposition at the site, depends very much on their quality (being able to act through different methods of transport and storage to reduce spread of dust).

Also, certain amounts of dust will be released and when applying ballast, stone broken and rough stone dam body.

The roads connecting the site works, circulation of materials transport vehicles will contribute to air pollution. Because environmental factors are not significantly affected air is preferable that the total engine power of the vans used at a time working at a location not to exceed 2000 hp.

Depending on the level of process technology, equipment and facilities used for phases of production operations constitute the sources of atmospheric pollution. Note that these sources are temporary, their effect is only resented during performance.

The impact of toxic gases can be recorded on the people of neighboring towns, on vegetation and soil psamofile or controlled / sand beach, but the effects are not significant, while aiming to reduce emissions from transport and execution of site.

Persistent organic pollutants (POPs) are chemical compounds containing carbon and to a certain level, are resistant to degradation petrochemical, biological and chemical. POPs are characterized by low water solubility but high in fat, leading, and because of their persistence, bioaccumulation in fatty tissues. Are semi-volatile substances, property that allows them to evaporate or to adsorb on atmospheric particles. Therefore, POPs can be transported very long distances, either by air or water.

Although many chemicals, whether natural or anthropogenic origin are POP, only 12 are considered by the UNEP (United Nations Environment Program) that may impact on human health and the environment, of which two - dioxins **and hexaclorobenzenii (HCB)** - are produced from burning oil and released into the atmosphere. Diesel fuel is probably used in all types of equipment used in rehabilitation of the shore, and perhaps considerable quantities are consumed, must draw attention to their impact on the marine environment and biodiversity.

b) Impact on the environment after completion of the works

At that stage after the completion of maintenance and operation works, there aren't stationary sources of air pollution.

6.3 Impact on water environment factor

Impact of anthropogenic pressures identified in the coastal Romanian Area comes from the pronounced development in different socio-economic activities of coastal natural area (land - sea area):

- Tourism and recreation;

- Agriculture and food;

- Construction of ships;

- Petrochemical, refinery;

- Mining: ore, sand in shallow coastal areas;

- The steel industry;

- Nuclear energy industry;

- Manufacturing;

- Ports and navigation;

- Expansion of existing tourist ports modernization: dredging activities;

- Airport and air transport;

- Building / districts holiday homes in tourist areas;

- Military and defense activities: land-sea shooting.

Environmental issues identified in the coastal Romanian zone induced by anthropogenic factors (land-sea area) are the followings :

- Coastal erosion / sediment dynamics on Danube: closing / clogging Musura Bay;

- Failure to complete the flood protection solutions: Undercrossing debusării Costinesti area;

- Intrusion of seawater into coastal aquifers: the former lake Costinesti;

- Water pollution / air, solid waste pollution from diffuse sources;

- Agglomeration of population in the coastal zone, in season;

- Uncontrolled development of tourism and construction of tourism and recreation activities over the affordability of environmental capacity;

- Road and sea transport in coastal areas: execution of a technological path over coastal protection in the North Constanta;

- Extraction of natural resources / sand beach: North Eforie area, Mamaia, Mangalia;

- Overexploitation of fish stocks;

- Loss of habitat / endangered species - construction of sea walls of coastal protection: Eforie South-Costinesti Tuzla;

- Urban sprawl: Mamaia area, weight lifting Pescaru, cliffs and built under natural conditions.

Among other activities that continue to exert an environmental impact on the environmental on the coastal marine ecosystem we include:

- Oil platforms,

- Port and underwater construction,

- Wind installations.

6.3.1 Impact on surface water

Substances in the mass of water,being in suspension, in floating, solid, liquid or gaseous solution, essentially determine water quality. Aquatic organisms are directly affected by these substances. In addition, they are affected indirectly by the effects of substances on other aquatic life forms with which they are prey or competition in ecological relationships. Different species and different developmental stages of the same species may show very different sensitivities and tolerances to environmental conditions, the effects of the substances and synergistic or antagonistic toxic substances. Starting from these theoretical considerations, the product will analyze the impact of the proposed works, both during construction and on the operation.

Impact on the water environment factor during construction works

The impact of works during the execution phase is determined by the organization and their ongoing and effective for the works (eg construction of large dams). Impact analysis will be done having regard to the impact of site organization and equipment used in performing the work activity, and depending on the extent of work proposed.

Making buildings will lead to suspension growth in sea water.

6.4 The impact on marine and coastal ecosystem

The impact area concerning the 'Protection and rehabilitation Romanian coastal zone' Master Plan includes virtually all the Romanian coast, from Sulina to Vama Veche, focusing especially on the development of shore protection works by dams and epiuri, enlargement of the beaches and installation gender structures submerged artificial reefs to lower force waves reaching the beaches.

Due to the scale works, shore structure will undergo changes, sometimes significant, changes that will focus not only shore shore emersion but submerged. In particular, in areas in front of tourist resorts (south unit), are taken into account the extensive work that will enlarge sanding beaches to large, but works that will change the structure of the seabed in these areas.

The works proposed for the north shore unit does not affect port infrastructure (Sulina and Midia). The works proposed in the south coast unit does not affect port infrastructure Constanta Constanta North and South, due to the existence of large dam that blocks the movement of sediment to pass input port of Constanta. The situation is similar in Mangalia Port area.

Because the entire Black Sea coast is included in ROSPA0076 Black Sea and in coastal Because there are a number of protected areas of interest included submarines in Natura 2000 - 0066 ROSC Danube Delta - the Navy, Submarine Structures 0237 ROSC Methane Saint George Beach ROSCI0197 submerged Eforie North - South Eforie, ROSCI0273 marine area from Cape Tuzla ROSCI0094 underwater sulphurous springs in Mangalia, ROSCI0269 Vama Veche - 2 Mai, ROSCI0293 Costinesti - 23 August and ROSCI0281 Cap Aurora, analysis is required further detailed the effects that these works will have on marine biota in these areas, in the design phase.

The works for coastal protection and rehabilitation involved in the most direct impact on species ranked only in its immediate vicinity. This means that the impact on pelagic species will be negligible, almost zero.

NORTH ERN UNIT-

PROPOSALS Work on medium and long term

Regarding the ***medium-term*** work in the Probe Channel (natural sanding of the beach) and Portita (sanding and building artificial beach) will have an ***insignificant effect*** on the habitat *1110 Sandbanks shallow* identified in the development area in the works.

Sanding can be done to limit the spread of *grasslands to maritime Ruppi macrophytes, Potamogeton pectinatus* to species of molluscs *(Cerastoderma glaucum, Lentidium mediterraneum.),* Also species of crustaceans *(Crangon crangon, Upogebia pusilla, Diogenes pugilator to.)* designated for the type of habitat *1110 Sandbanks permanently submerged shallow* will not be significantly affected because they are mobile and maintain at depths between 0.5 to 25 m, inisiparea being made to the depth of 0.5 m .

Proposed measures on ***long-term (2021 - 2041)*** will be completed by further studies, and the solutions chosen will take into account the recommendations of the Management Plans ROSCI0065 areas Danube Delta and Danube Delta ROSPA0031 Razim-Sinoe, and the environmental impact assessment in the design phase.

CONSTANTA – MAMAIA AREA

The effect of the works over terrestrial habitats is negligible. In Constanta area, there are basically no natural habitats on the cliffs, these being covered by secondary vegetation strongly anthropic or are converted into green areas.

In Mamaia area and especially in Mamaia Mamaia area, the areas where important plant habitats are present from conservative point of view exists should be considered and the works must be carried out strictly protecting them. Also, large-scale sanding works will be done outside of the migration and wintering period of the specific beaches birds, which are resting or feeding on littoral belt. Habitats on the beaches will be affected only during the progress of works. Later, after works finalisation, organisms associations on supralittoral area will recover without difficulty.

In terms of marine habitats, nor in this case noticeable effects are recorded. Bottom structure will allow restocking fresh recharged areas with elements of the fauna existing beyond the area where sand filling is done. Breakwaters, jettey, artificial reefs will be populated with the same species existing in areas with rocky substrate, with the possibility of installing also invasive species taking advantage of the unoccupied substrate of native species.

Given the degree of human intervention area, effects on avifauna will be at a small scale. Heavy traffic from the working premises, equipments activity on the shore and on the sea will be a

stress factor for birds fauna. We recommend that the works to be carried out in compliance with working rules regarding the emission of dust and noise and to avoid activities during the migration. The fact that Siutghiol Lake has a big importance for winter period is not likely to interfere with work performance, these works being executed during the warm season of the year.

AGIGEA AREA

The proposed works will have an indirect impact on **ROSCI0197,** mainly by increasing water turbidity (due to the resuspension of sediments and marine clay intake rockfill), which will affect the whole area. However, because on the littoral cell dam bordered by Constanta port South dam and Cape Tuzla, currents and sediment flow is predominantly from south to north, the ***impact*** on Natura 2000 site will be ***temporarly, of low intensity*** and ***the effects will be reversible.*** To reduce the maximum impact over *ROSCI0197* it is recommended, if possible, that the work to be conducted during the summer. Impact on ***ROSCI0073*** will be practically ***zero.***

Sanding and construction works in the mid term, provided between the Agigea dam and Steaua de Mare hotel will significantly affect the natural rocky habitats here and the *Pholas dactylus* bivalve populations, species protected by the Berna and Barcelona convention. This impact may
ALTERNATIVE SOLLUTIONS

1. No intervention in the area;
2. To identify technical sollutions leading to natural sand accumulation in the area, without making additional recharge.

Measures to reduce the impact:

1. Dams positioning so that construction eorks not to directly the 1170-10 cu *Pholas dactylus* habitat;
2. Works to be done during summer.

EFORIE NORTH AREA

Short term Works might mainly affect the Sandy hábitats, with a posible negative effect over *Donacilla cornea* si *Donax trunculus species,which can be controlled and limited through measures of reducing the impact.*

In ***submerged ROSCI0197 North Eforie Beach - South Eforie Beach ,*** located practically on the edge of the south area of the tourist port (Marina North Eforie), the suspensions which will result from the activities of sanding and building dams will be largely blocked by the North dam of the tourist port and diverted to large, affecting partially the northern extremity of ROSCI0197 *submerged North Eforie Beach - South Eforie Beach. F***rom this point of view we appreciate that the effect on the protected area of interest mentioned will be of low intensity.** Also, a ***low intensity impact*** will be felt in ***Marine*** protected area ***ROSCI0273 from Cape Tuzla,*** located south of South Eforie, because the protected area is deep into the sea, exceeding 10 m depth isobath

Regarding the effects of proposed works upon the ***ROSCI0073 marine dunes from Agigea,*** the protected area located at about 4 km north of North Eforie, we consider to be ***void.***

Measures to reduce the impact:
1. monitoring the dynamics of Donax trunculus and Donacilla cornea species before, during and after the execution of the works;
2. artificial sanding rate reduction in accordance with the monitoring of the results.

MIDDLE EFORIE AREA

The impact on *submerged ROSCI0197 North Eforie Beach - South Eforie Beach.* We appreciate that the potential technical solutions proposed in the Master Plan will have a ***significant negative impact*** on 1140-3 "medlittorale Sands 'and 1110-3' shallow fine sands" habitas, and in case of achiving the works the loss of habitats and species will be permanent and final, because there is no possibility of recovery.

ROSCI0273 Marine area from Cape Tuzla. In this case, the effects of the works are void.
ALTERNATIVE SOLUTIONS
1. Do not make any site works in or in its vicinity.
2. The identification of some technical solutions that will lead to natural accumulation of sand on the beach that borders the site, such as a large extension of marina port or building a jetty in its extension.

MEASURS TO REDUCE THE IMPACT:

1.On the population dynamics of *Donacilla cornea, Ophelia bicornis and Donax trunculus* detailed scientific research are needed to determine if there are times / places / technical solutions that will make possible the carry out of sanding without affect them.
2. Scientific research methods to identify a work method for artificial beach sanding, as possible to reproduce the natural phenomenon of sanding or accumulation of sediment in the area, both in short terms (due to type storm events) and also in long terms (seasonal).
3. For sanding in sectors North, Central and South Eforie **Do not** use sand beach extracted from the submerged ROSCI0197 North Eforie - South Eforie or its vicinity, this being a particularly dangerous for the site. It is necessary to completely avoid the extraction of the sand from the littoral cell between the south jetty of South Constanta Agigea Port and Tuzla Cape. Sand for sanding must be brought from other sources, and work must be conducted on shore.

SOUTH EFORIE AREA

The main impact on the two neighboring sites is given by the sediments that can be carried by currents in the construction work but after that, and also by the muddy water filled with fine sediment to be transported on long distances. Given that the currents and sediment transport is predominantly from south to north, we consider the ***impact*** on ***marine are ROSCI0273 from Cape Tuzla*** will be ***insignificant,*** while the **impact** on ***submerged ROSCI0197 North Eforie Beach - South Eforie Beach*** will be ***significant, but temporarily,*** with good possibilities of habitats and species recovery after cessation of work.

COSTINESTI AREA

Although the proposed works of Master Plan will not extend to the territory of the new marine Natura 2000 site ***ROSCI0281 Costinesti - 23 August,*** these works may have a ***significant indirect impact*** on ***coastal areas*** of the protected area through migration to the south of the sediment used for sanding. They run the risk of clogging the rocky midlittoral around the Forum Hotel. This impact could completely destroy here the protected habitats (*1170-6 Upper midlittoral rock, 1170-7 Lower midlittoral rock , 1170-10Funny infralitorale hard clay with Pholadidae)* and *Pholas dactylus* populations with no possibility of recovery. Also, high turbid waters generated during the works will move south into the protected area and may cause temporary damage to the populations of macrophytes algae and the associated fauna.

MEASURES TO REDUCE THE IMPACT :

1. Do not make any kind of work that directly affect the natural rocky shore at Forum Hotel (located on the northern limit of the site ROSCI0281 Costinesti - 23 August)
2. In the technical solutions adopted to identify solutions to mitigate the loss of sediment within the Natura 2000 site, such as a building block epiu to Costinesti beach sediment migration to the south, to prevent their entry into the Natura 2000 site.

OLYMPUS AREA

The works for removing the existing structures so as to large the bays, and also the construction of new protection structures, would have ***an indirect negative impact insignificant, on short term*** on the protected area *ROSCI0281 Cap Aurora*, *by high turbidity waters released.* During construction works, *pelagic species* (marine mammals and some fish species *Alosa Immaculate, Alosa Tana)* will be disturbed, will be removed from the coast but they will find the refuge in Cap Aurora site, which has a large extension to large . After completion of the works, together with the improving of trophic resource, the pelagic species will return to shore, so ***the effect will be negative temporarily.*** Biogenic reefs of *Mytilus galloprovincialis* will not be affected by building dams or sanding works, because they we meet them in the large depths (30 -45 m depth).

The effects of work on the new site ***ROSCI0293 Costinesti - 23 August,*** the north area of the concerned area will be ***void***,because the marine currents have direction from North to South.

The effects on the ***ROSCI0094 submarines sulfur springs from Mangalia*** will be ***negligible*** because the distance is considerable (about 5 - 6km). Only in case of discharge of large quantities of sand in case of storm with wind from the north to east there is the risk that the particles in suspension to reach the southern coast, in the protected areas mentioned. On the other hand the shore structure encourages the diversion of the sediments in suspension and their submission to the wide before reaching the perimeter of the two South marine areas.

NEPTUN AREA

We appreciate that ***the impact*** on the ***ROSCI0281 protected area Cap Aurora will be insignificant temporarily***, only during the execution of the works. Because of the mainstream from north to south, sediments have no way to reach the offshore. During construction works, the pelagic species (marine mammals and some fish species *Alosa Immaculate, Alosa Tana)* will be

disturbed,and it will be remove from the Black Sea coast. After completion of the works, while improving the resource trophic pelagic species recource,they will return to shore.

The effects of the work on ***ROSCI0273 Marine protected area from Cape Tuzla area,*** the area north of Neptune, will be practically ***zero.*** The protected area at long distance and the direction of current that could lead particles in suspension is from north to south , along the coast.

The effects on ***sulfur springs ROSCI0094 submarines sulfur springs from Mangalia*** **and on** ***ROSCI0269 Vama Veche- May 2*** will be ***void.***

Effects on ***the oak trees in Neptune.*** Natural monuments, secular oaks from Neptune are included in a green space remote from the sea, on the opposite bank of Lake Neptune. In these conditions, the effect on construction works on coast upon this natural monument is virtually ***zero*** .

JUPITER – VENUS AREAS

The proposed works will take place at the western boundary of the protected area ***ROSCI 0281Cap Aurora,*** specifically between the western boundary of the protected area and shore. The works can not significantly affect the general area of the site, but ***may have a significant impact*** on coastal areas of it, which contains extremely important conservation objectives.

It is highly likely that some of the sediments resulting from the project will be carried by currents in the southern Cap Aurora site (the site where the limit starts from the shore) and in the sulfur Springs from Mangalia area. However, due to the existing protective dums, the amount of sediment that could reach the sulphurous springs from Mangalia is estimated to be reduced. In conclusion, the ***impact*** on ***ROSCI0094underwater sulphurous springs Mangalia*** will be ***slightly negative.***

The rocky infralittoral area will be deeply affected deeply where they will perform sanding works , where the rocky bottom habitats characteristic are about to be replaced with sandy habitats.

Offshore rocky area, where there will be done works of location the artificial reefs parallel to shore will be affected during the execution of works, mainly due to the suspension which will then be deposited on the bottom and will be driven along the coast, south . But, after the

completion of the work, artificial reefs will integrate existing habitats, representing points recovery of populations of invertebrates and algae macrophytes.

The impact on *Marsh ROSCI0114 Mlastina-Hergheliei and High Oban and Movila, ROSPA0066 Limanu - Stud.* In the case of Movila Cave, the impact will be void, given the fact that the protected is farther away from the targeted area. Regarding Mlastina Hergheliei and Limanu Lake and due to the importance of avifauna, it is recommended that traffic with heavy machinery not to be performed in the immediate vicinity of the access roads (the litoral herd of swamp and sea) but because avifauna to be unobtrusive. Access to the protected areas recommended to be restricted to any heavy machinery, noise causing discomfort or other fauna.

MEASURES TO REDUCE THE IMPACT :

1. Do not made any works that affect the bay formed between the two epiurs near Carmen Hotel, located inside the 0281 ROSC Cap Aurora site, likely to lead to limit free communication with the sea or clogging with sediment. In this area may be allowed only recovery works of the two epiurs, provided that the works to be carried out only on the face from wide side of them.
2.Do not allowed any other kind of work within the bay or off it, which would lead to limit free communication with the sea or from clogging with sediment.
3. To reduce the negative impact of high turbidity waters, sanding or construction of dams to be done in good weather, calm sea, little wind (up to 2-3 Beaufort winds and high grade level 2-3 Douglas).

AREA BALTA MANGALIA (MLASTINA HERGHELIEI)

The works proposed for this area have an indirect and temporay impact on ROSCI0114 Mlastina Hergheliri and - Oban High and ROSCI0281 Cap Aurora.

SATURN –MANGALIA AREA

The impact of *demolition of existing structures and* of sanding would be ***particularly serious*** *upon the* marine habitats *underwater sulphurous springs ROSCI0094* site *in Mangalia.* It will be destroyed totally and irreversibly both habitat 1170-8, which contains 90% of the species *Cystoseira barbata* area of Romania and also the habitat 1110-1 containing yhe only *Zostera noltii* meadows that exist in Romania. All other habitats, including sulfur springs they contain,

will be severely degraded by mechanical damage or clogging with sand. We appreciate that this impact is so devastating so to lead to the cancellation of Natura 2000 site.

Since the territory site is rocky natural shore , having a natural rhythm because of this very slow erosion, and it is already consolidated with heavy protection works, the erosion risk is minimal. Therefore, to achieve the objective of conservation of the Natura 2000 site and protect the natural structure of rocky habitats, consider that the proposed works are not necessary.

Impact on ***ROSCI0114 Mlastina Hergheliei - Oban High and Movila Cave, ROSPA0066 Limanu - Stud*** will be ***negligible.***

Impact on ***ROSCI0269 Vama Veche - 2 May*** will be ***insignificant*** due to its defense by dams of Mangalia port

.
ALTERNATIVE SOLUTIONS:

1. There can be no remaining permitted works as demolition of existing structures, because it would just destroy the habitats for which the site was said. It can only accept rehabilitation works of existing structures in their current form.
2. There can be no remaining permits sanding works for just the same reason. The only exception is the socket formed between the south coast last two epiurs Mangalia (President Hotel, Teilor Street), where you can accept a sanding 20m.
3. There can be no allowed building works of new structures to defend the coast.

AREA 2 MAI

Expected ***impact*** of development works (minimum scale) on the protected area ROSCI0269 Vama Veche - May 2 will be ***minimal and temporary*** during execution works.

To minimize the impact that the project it can have on the draft marine protected area will require a study design point of environmental impact assessment. Works from the cliff can be started only after a thorough research on species and plant associations present here, to not destroy endangered plant species or halophilic arenicole (unfortunately, the area became increasingly anthropogenic and assaulted by ruderal species)..

Concerning the proposed works of long-term implementation Master Plan (2021-2041) for northern unit, they will be implemented in the Danube Delta Biosphere Reserve. Impact will be analyzed punctual at the beginning of the project itself.

Danger of destruction of the natural environment in case of accident

In case of applying inappropriate management during execution works of coastal protection and rehabilitation of the Black Sea coast (north unit), it can destroy the beach in close proximity to the intervention and damage coastal areas due to inadequate refueling shore sediments dredged by downloading off the beach submerged, restoration of existing structures, etc. shoreline reconfiguration., inappropriate storage of materials and waste, the uncontrolled discharge of wastewater on the ground etc..

Impact on phytoplankton in accidents during the execution of works by equipment failure and finally by oil spills in the marine environment *can not be considered significant*, and depending on the extent of the accident. Possible hydrocarbon film on the surface will have a screen, lowering light intensity that enters the water table and therefore the light used by microalgae fotosinteaza. It is possible that due to water turbulence, to be a percentage of hydrocarbons in water table may directly affect species of microalgae by embedding the mass of hydrocarbons. There is danger of a minor oil pollution (oil, fuel oil) to the marine environment, and so the zooplankton community and especially those species hiponeustonice, if an accident happened to the used equipment, product nefavorbaile weather (wind, waves, etc..) but their exploitation and neglect faulty operation. The data from the literature, it was found that oil and its compounds in concentrations of 0.001 ml / l zooplankton organisms may accelerate death, or whatever capacity reduction to 20% survival of individuals. For ciclopidul *Oithona nana*, some deviations were obtained when they were exposed to oil and oil whose concentrations did not exceed 0,001 ml / l. Exposure to concentrations of 0.1 ml / on zooplankton organisms killed after 24 hours. Exposures of 5, 30, 60 minutes at Diesel oil (concentration 1 ml / l) led to shorter survival of zooplankton organisms. Similar results were obtained with larval stages of benthic organisms. But, it was found that marine plankton accumulates rapidly, but slowly and almost entirely depureaza oil fractions. Therefore appreciate that *the effects of accidental oil pollution in the zooplankton are partial, temporary and reversible.*

6.5 Expected impact on shore morphology

The shore is the fundamental unit of littoral. Here are held the intense energy conversion processes and materials, reflected in the dynamics continuous relief. This young and dynamic relief is the material support of all forms of human impact. Most of the protection erosion, development of new tourist areas and settlements, development sites port, are located in the

shore. The answer of this territorial fragile system to various forms of human impact is different; positive for optimization relationship between artificial and natural structures, or negative, accompanied by large damage, when creating discordant relationships between constructions and any relief.

Planning and construction of hydraulic works, made over time on the Danube and its tributaries have resulted in serious reduction in the amount of sediment discharged by this river into the sea, with negative consequences on the balance of the coastal sediments. In addition, hydraulic works and the coastal port of damming were interposed in the path of marine currents, leading to virtually blocking sediment deposits on the shore causing erosion especially strong on the beaches of Mamaia. For this reason have made various types of hydraulic works to prevent this phenomenon, especially in the southern resort, the most affected in this regard. Coastal erosion is a particular problem in Mamaia beach, breakwater that shelters due to the expansion port of Midia (5 km) and acting as a barrier to north-south traffic on the coastal marine currents. The dam rejected by the general to the south-east flow of suspended sediment flowing to shore, making virtually the Mamaia beach in a bay almost completely devoid of natural sediment influx. In general coastal erosion and contribution added to hydroelectric dams owned, built on the Danube. During winter 1998, the south of the beach has been severely affected by erosion. Between 1966-1988 the dry shoreline has retreated by about 59 meters, the 88,900 m2 totaling an area of eroded beach. This is why making the Emergency imposed protections on Mamaia beach (building along the shore of a total of six dams and protection works sanding machines). After implementing these measures to protect coastal shoreline withdrawal phenomenon decreased to 35 meters are found only on a small portion of the beach. In the period 1979-1995 was recorded a maximum accumulation of sediment which has pushed toward the shore line about 15 meters high. Artificial beaches sanding works is widely used increasingly being considered an option "soft" management of erosion phenomena, compared to engineering works "hard" construction of large dams and barriers of "break wave ". Advantages innisiparii artificial beaches, as well as management options include the results offer a positive side which significantly improves the aesthetic value of recreational and lessens the likelihood of future erosive effects of nature. Sanding procedure artificial beach in Mamaia was applied in order to restore portions of the beach affected by erosion, by carrying out works of "filling" with sandy material properly. But, unfortunately, sandy material used in this work has turned into a very fine material and is therefore not been possible to obtain the desired result. The literature clearly specifies the basic principle according to which such works are completed, meaning that filling material should correspond exactly in shape and size of which is formed at the beach. But if protection works in Mamaia this principle has been neglected. Another basic principle which has been treated superficially in this case, and that every man in such works should avoid extremes when filling material because of the beach is too fine (ie sand extracted from Lake Tanning and Siutghiol) local turbidity problems occur associated water retention. The result works in Mamaia made under such conditions led to an increase in the rate of erosion, which is much higher than

average for this type of environment. Large dams of "breaking wave" have a moderate positive effect, dissipating the energy waves towards the shore thereby reducing the force of water. As a consequence, the southern part of Mamaia beach is partially protected against the effects of erosion, but only under strictly in the right portions of these levees allow recovery of the beach. Shallow underwater profiles that make up the Mamaia beach protection, reveals a change (from -1 to -4) parameters that define a acvatoriu equal pressure on the side high, behind the dam of "breaking wave".

The negative aspects of dams are:

- inestetic image caused by their presence;
- Extremities of these dams are falling as a result of erosion processes exerted by water pressure;
- Reversal of currents lead to erosion of beach located between dams portions;
- Expansion and erosion of the beach unprotected portions;
- Regime change marine currents
- Significant changes in beach profile;
- Reduction of sediment transport
- Reduce the quality of bathing water in the summer sea
- Uncontrolled migration profiles tetrapod (stabilopozii) that make dams "breaking wave"

Mamaia beach erosion risk persists because it is formed by a narrow tongue of land subject to hydrodynamic forces and the lack of sediment intake naturally. Protection measures and hydraulic works were undertaken during the communist regime when Mamaia beach was seriously affected by erosion. Infrastructure and tourist activities have suffered significant damage. A missing an important piece of beach and the seafront promenade. If erosion continues, and no action is taken to protect beaches optimum protection, this potential risk of erosion will persist with the possibility that during future storms to be destroyed and the beach resort of Mamaia.

6.5.1 Impact on soil forecast

For additional material coming from the area belonging to the old decommissioned dams to be ineffective is well equipped to plan the works to be transported and stored at a location in port Constanta and will be used as filling material in other coastal works and even works provided as they present a high content of sand. The volume of material resulting from excavations carried out in accordance with the plan of excavation, to achieve stone cushion, will be stored near the sites of dams and will be stored and redistributed on areas vulnerable area of the beach / seaside cord, to large and / or lake at a location to be fixed later depending on the geochemical and physical characteristics / grading of sedimentary material. The impact of physical / mechanical

and storage forecast of excavations in the area because the soil has acceptable values. Due to the possible location of the first layer of groundwater at the rate of about 1.0 m, its isolation is not required for both optimal execution of the foundation, and to avoid the accumulation and migration of pollutants in soil. Although the technology used will involve changing the rocky soil quality and resistance, it is not detrimental to surrounding areas for biological activity. In addition, for the situation because there is no cross-border impact.

6.6 Impact on human factor and human settlements

The main impact on the analyzed area occurs during the execution of works. Intense flow of construction equipment to the premises, the operation of concrete plants, diversion and temporary restriction of traffic flow will be temporary sources of discomfort for people resident or working in the area studied. The impact is primarily produced by the already mentioned sources of air pollutants and noise-induced additional equipment in operation. This impact is temporary is producing only during the execution of works. Taking into account manufacturing technology used does not predict a significant negative impact on human settlements and other targets in the area, including tourists who use the facilities in the area. During summer there is a risk of negative impact by landscaping discomfort because the work will be carried out no risk to the safety sezonului.Totusi residents and tourists. Noise and vibration will occur especially during the execution of execution lucrarilor.Timpul will be restricted so that at night the activity will cease. The negative impact of noise is defined as a change of morphology and physiology of body weight loss resulting functional capacity, weak capacity to compensate for additional stress or increase vulnerability of an organism to the harmful effects of environmental factors. This definition includes any temporary or permanent reduction in physical, functional, physiological or social humans or human organs. Negative action on the human body and vibrations have a frequency less than 20Hz (infrasound). Vibrations, acting simultaneously with relatively high intensity noise, are reported by components of the inner ear and lead to overuse whole auditory organ, leading, according to their energy and direction of action, relative displacement, ligament tear or even bleeding internal organs.

Long-term effects that are related to general modification of the initial conditions are positive and were reported in paragraph 6.1

Reversible effects are those that occur during the implementation of works and measures proposed and which usually have a negative influence only on the period. The measures to reduce environmental pollution and protection of human factor taken by the manufacturer (such as providing sanitary facilities for workers higienico, cement concrete plant equipment and filters

for dust retention, a good management of site organization, etc.), negative effects on health will be reduced to a minimum.

Irreversible effects, in terms of public health are harder to quantify because the right way related to the implementation of Master Plan. Basically coastal tourism revival and improvement of quality of life can be considered as positive effects irreversible. The correct application of Plan provisions will not lead to irreversible negative effects.

Fishing in the coastal fishing using stationary tools represents only 25% of the total catch, most tools are located north of the study, while most recreational fishing areas, using boats, are located outside the site the works. Partial use of fishing ports located in Unit 4, 5 and 6 as construction sites may cause some inconvenience fishermen and may result in minor negative impact on fisheries. In terms of landscape, in general, a draft coastal protection and rehabilitation aesthetic harmony of beach damage by installation of heavy structures. Within this coastal protection plan, 200-400 m long dams are located with each 700-1200 m intervals, artificial reefs and structures are located below the water. Thus, the impact is considered minimal aesthetic harmony, without the need for mitigation.

CHAPTER 7. Significant environmental effects in a Transboundary Context

The impact of protection works on the physical parameters of the marine environment presents a significant temporary effect, because the technical solution adopted, will significantly influence the physical characteristics of the environment, respectively seabed morphology, nature and distribution of sediments. Turbidity phenomena that may occur have a local character, with a shortened and limited to surface effects built sector, given the use of constructive solution of the dams of stone or geotextile bags filled with sand. The proposed solution to stop the erosion will reduce the surface wave parameters housed, and a decrease in velocity Marine, and hence a stagnation of water in areas of" "shadow".

Master Development Plan was based on a detailed analysis of maps and historical information related to shoreline changes. This analysis included the evaluation of variations of the past and current works in conjunction with existing defense and big dams port. The purpose of this assessment was to determine the causes and effects of past interventions and natural evolution to make predictions about the future evolution.

Modeling work has included studying littoral sediment transport and shoreline variations starting from a set of data on an interval of 17 years taken from a calibrated model of the waves. General direction of sediment transport in beach area to the south except in areas sheltered from waves from the north and the more exposed areas or waves from the south southeast, such as those housed dams and Constanta ports Midia, or what is are sheltered by natural headlands as head of Tuzla (Fig.7.1.)

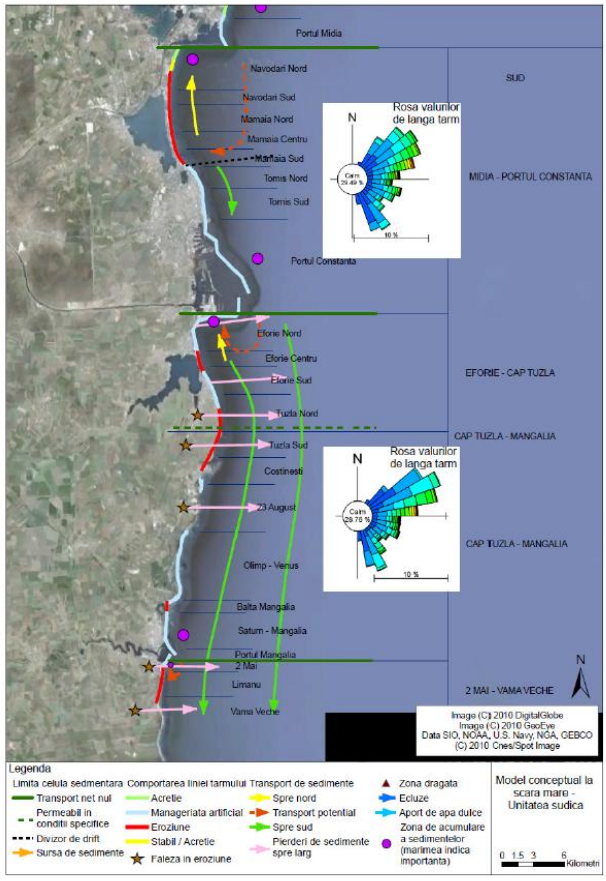
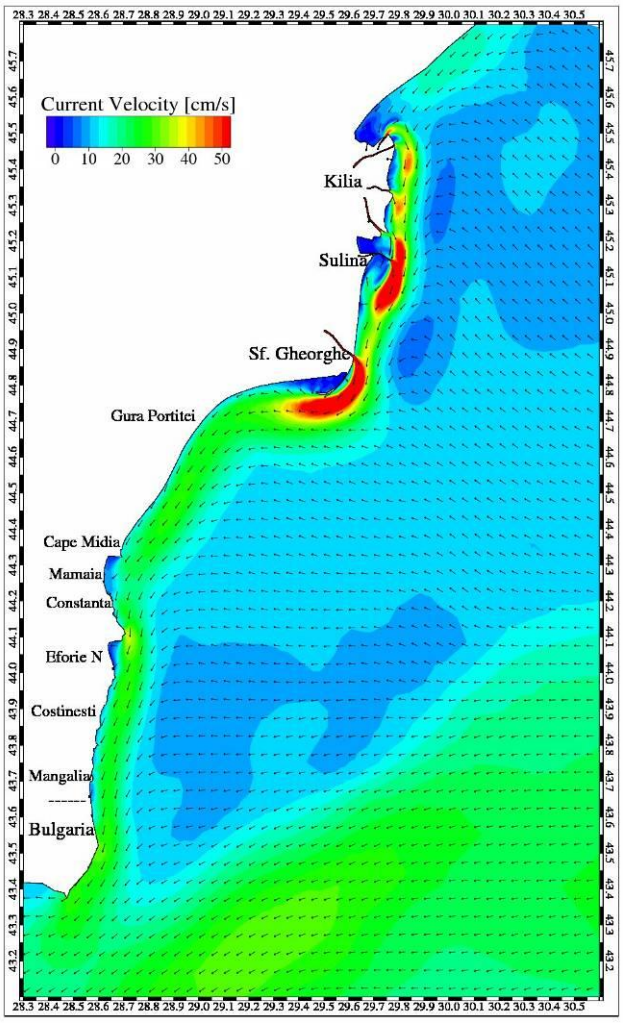


Figure 7.1 A conceptual model of the southern unit

Modelling currents and sediment transport in relation to winds and density gradients created by flows from the Black Sea have shown that the energy current is too low to reexercise sediments,

except in areas of close proximity to the coast, where currents are stronger as a result of wave action (Figure 7.2 and 7.3). Currents are influenced by wind and density variations induced by the Danube, and the model showed that in general typical current direction is south parallel shore.



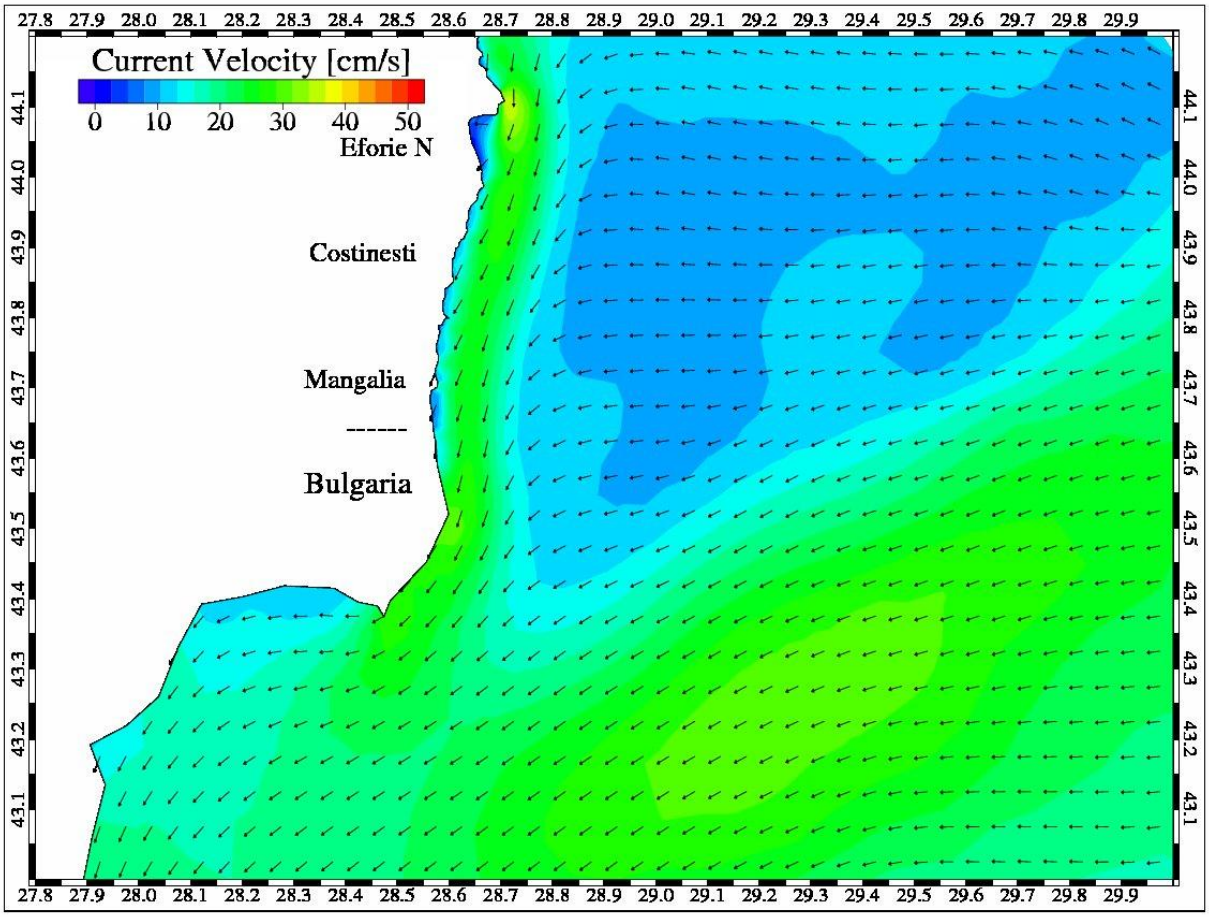


Figure 7.2 Surface currents along the border area of Romanian-Bulgarian coast, in windy conditions in the North-East with speed 5 m / s, cold season

The Divisions of Romanian littoral in terms of sea transport

Although the sediments are generally transported to the south, though this trend is not continuing, as evidenced by fragmentation of a series of litorale. Littoral area can be divided into two coastal units which are generally independent: the north unit characterized by a low Delta and drive south coast of cliffs interrupted characterized by the presence of intermittent beaches located in front of coastal lakes.

Modeling, together with analysis of past variations of shoreline sediment samples and analysis led to identification of the fragment coastal divisions of the coastal system in subunits called "sedimentation cells" (Figure 7.4). Coastal protection projects proposed in Master Plan will have significant effects only in the cell sedimentation in which these works are proposed.

Figure 7.4 Southern Division Unit of the Port of Constanta to Vama Veche in coastal sedimentary cells: Eforie - Cape Tuzla (S3), Cape Tuzla - Port of Mangalia (S4) and 2 Mai - Vama Veche (S5).

The main limitations of coastal drift divisions are located in major ports Midia, Constanta and Mangalia or natural headlands such as the Cape Tuzla (Figure 7.4). Operation and maintenance of dams to Midia port, Constanta and Mangalia are not part of the Master Plan goals, but Master Plan requires that these structures will remain functional during the time horizon of the Master Plan for 30 years.

Sediments taken from the Danube Delta area beaches are south of the port of shipment to Midia, and therefore changes in sediment regime of the northern unit will not have influence on Southern Unit (Figure 7.5). It can be concluded that intervention measures to control erosion in the Northern Unit **will have no** impact on the territory of Bulgaria in terms of sediment transport and coastal evolution.

Figure 5 7.5Rate and sediment transport directions longitudinal net <u>potential</u> on the Romanian coast, projected with LITDRIFT

The potential impact of the works of Southern Unit

The Southern Unit of the coast is divided into cells of dams sedimentation in Constanta and Mangalia port and natural promontory of Cape Tuzla (Figure 7.4). As mentioned previously, harbor dams are not included in the Master Plan objectives.

Constanta Harbor is a major coastal element separation, blocking the transport of sediment along the coast so that the proposed works north of Constanta port will not have influence on the Bulgarian coast.

The works proposed between Constanta Port and Cape Tuzla will have no effect on the Bulgarian coast as a result of littoral drift fragmentation Tuzla and Mangalia.

Similarly, the proposed works in the area between Tuzla and Mangalia can have significant effects on the coast south of Mangalia, as coarse sediments can not cross port of Mangalia dams to power the southern shore.

Long-term coarse sediment transport on beaches will have effects on cell sedimentation located due south of Mangalia significant length of port breakwaters that extend towards the sea, beyond the depth of coastal sediment transport closure - which means that sediments are spread to wider areas with deep water and lost in the system that supplies shore.

The impact of the works located South of Mangalia

The Proposed works of the south of Mangalia may have a potential impact on sedimentary areas in the same cell. Sedimentary cell extends beyond Mangalia to Vama Veche, at Cape Shabla in Bulgaria. Considering the sensitivity of protected marine sites located in large towns in the May 2 and Vama Veche, the works proposed for this area in the Master Plan are minimal. The proposed works consist of the south of Mangalia foot cliff protection works in the May 2, including the military unit and rehabilitation of existing fishing pier on May 2. To avoid possible effects on marine protected areas have not provided significant works sanding beaches.

Natural source of beach sediment in sedimentary cell between Mangalia and head Shabla consists predominantly of shells and fragments of limestone from the limestone platform erosion. Although there is active erosion of the cliffs Limanu and other areas, cliffs of loess consist mainly of fine sediments that result from the decomposition are not retained on the beaches but disperse offshore during storms.

In this context, the punctual works of the cliff foot protection, such as that in the May 2, will not have significant influence in terms of sediment volume and therefore the proposed works will have no impact impact on the coastal Bulgaria Area.

Chapter 8. Preventive / compensation reduces the adverse environmental effects

Government Decision no. 1076/2004 provides the establishment of "measures to prevent, reduce and offset significant environmental effects resulting from implementation of the plan." In the environmental report and the evaluation study are offered a range of appropriate general measures to prevent adverse impacts on environmental elements considered relevant in the strategic environmental assessment, taking into account the fact that the Master Plan are promoted appropriate measures to limit the adverse environmental effects.

The dates provided by the Master Plan are not enough to propose concrete measures to reduce environmental impact. When designing the proposed works of the Master Plan,we will be able to analyze the impact point on the environment and additional protective measures may be required. In this environmental report are general recommendations concerning the measures that need to be taken to reduce the environmental impact of proposed works.

A number of measures have been taken in preparation stage of the Master plan in order to limit the possible impact on the environment and biodiversity, such as:

- selecting the intervention so as to limit the possible impact on the environment and protected areas
- giving up of a certain types of work or their limit when near or within a protected natural areas

In addition to reducing the environmental impact on protected natural areas it is recommended:

- application of appropriate environmental management both during the execution of protection works and rehabilitation of the coastal zone of the Black Sea coast, and during the operation;
- determining the period of intervention during the heating season to reduce the impact on bird species
- the works in phases, along with biodiversity monitoring so that they can minimize their impact on
- It is recommended that work on coastal protection and rehabilitation of the Black Sea coast to take place in as small a space, area for excavation and dredging to reduce the

possibility of extending the negative effects on the environment and thus the communities of aquatic organisms.

- sanding of scale works will be carried out migration and wintering period of specific birds sea beaches, which are resting or feeding on litoral.

- Implement recommendations of the evaluation study

Land area may be negatively affected by work activities performed during the progress of transportation, dust emissions, noise. To reduce / limit the adverse effects to strictly enforce the rules of work on site (fences absorbing, wetting, making noise generating activities between the hours 8.00 - 16.00 etc) or transport (using sheets or tarpaulins covering load) .

In accordance with Law no. 82/1993, the Management Plan Danube Delta Biosphere Reserve (RBDD) approved by the Scientific Council of DDBRA for special areas of conservation ***Sacalin-Zatoane (21,410 ha) and Grindul Chituc (2,300 ha)*** –there are prohibited ***any works that would disturb the ornithofauna species during migration and wintering spring-fall,*** increasing thus the anthropogenic pressure on areas with full protection of the Delta (related to coastal zone). These special areas of conservation are important areas for breeding, migration and wintering for many species of seabirds.

In Constanta and Mamaia AREAS should be avoided works in the cold season not to disturb wintering aquatic birds that migrate or seaside. It also requires that the works should be carried out in accordance with work rules regarding the emission of dust and noise. The fact that the big Siutghiol Lake matters for the winter, is not likely to interfere with work performance, these being executed during the warm season of the year. Given the importance of protected areas of interest mentioned, during the works, should be observed the environmental legislation in force.

In **NORTH EFORIE AREA** is necessary the execution of the works in periods of calm sea, although it is estimated that much of the suspension generated during the execution of the works will be blocked by the North dam of tourist port (North Marina Eforie) and diverted to large, so order to reach their maximum limit in the extreme North of ROSCI0197 Eforie North - South Eforie Eforie Submerged Beach.For sanding in the North not to use sand extracted from the site ROSCI0197 Eforie North - South Eforie Submerged Beach or its vicinity, this being a particularly dangerous for the site.It is necessary to completely avoid the extraction of sand from the littoral cell between the south jetty of the Port of Constanta South Agigea and Cape Tuzla. Sand for sanding must be brought from other sources, and work must be conducted on shore.

Alternative solutions are proposed as follows:

1. No intervention in the area;
2. Sanding in steps to allow the restoration of the habitats and / or their adaptation to new conditions;
3. finding technical solutions that lead to natural accumulation of sand in the area.

In **Middle Eforie**

1..On the population dynamics of *Donacilla cornea*, *Ophelia bicornis and Donax trunculus* detailed scientific research are needed to determine if there are times / places / technical solutions that will make possible the carry out of sanding without affect them.

2. Scientific research methods to identify a work method for artificial beach sanding, as possible to reproduce the natural phenomenon of sanding or accumulation of sediment in the area, both in short terms (due to type storm events) and also in long terms (seasonal)

3.Alternative solutions are proposed as follows:

1. Do not make any site works in or in its vicinity.
2. Sanding to be done gradually / in stages of the beach, along with close monitoring of the dynamics of populations ***Donacilla*** *cornea, Ophelia bicornis* and *Donax trunculus* and their adaptability.
3. Identification of technical solutions that lead to natural accumulation of sand on the beach that borders the site.

SOUTH EFORIE AREA required that the work on protective structures in the North resort and artificial reefs will be limited only in days of calm (2-3 Beaufort winds and high degree grade 2-3 Douglas) or air circulation in the North (North, North East or North west), and when the sea is rough and strong winds have stopped them. For sanding Do not use sand extracted from the site ROSCI0197 Eforie North - South Eforie Submerged Beach or its vicinity, this being a particularly dangerous for the site. It is necessary to completely avoid the extraction of sand from the littoral cell between Constanta Port dam South and South-Agigea Cape Tuzla. Sand for sanding must be brought from other sources, and work must be conducted on shore.

COSTINESTI AREA:

1. Do not make any kind of work that directly affect the natural rocky shore at Forum Hotel (located on the northern limit of the site ROSCI0281 Costinesti - 23 August)
2. In the technical solutions adopted to identify solutions to mitigate the loss of sediment within the Natura 2000 site, such as a building block epiu to Costinesti beach sediment migration to the south, to prevent their entry into the Natura 2000 site.

JUPITER –VENUS AREA

1. Do not made any works that affect the bay formed between the two epiurs near Carmen Hotel, located inside the 0281 ROSC Cap Aurora site, likely to lead to limit free communication with the sea or clogging with sediment. In this area may be allowed only recovery works of the two epiurs, provided that the works to be carried out only on the face from wide side of them.
2. Do not allowed any other kind of work within the bay or off it, which would lead to limit free communication with the sea or from clogging with sediment.
3. To reduce the negative impact of high turbidity waters, sanding or construction of dams to be done in good weather, calm sea, little wind (up to 2-3 Beaufort winds and high grade level 2-3 Douglas).

SATURN – MANGALIA AREA is recommended that alternative solutions:

1. There can be no remaining permitted works as demolition of existing structures, because it would just destroy the habitats for which the site was said. It can only accept rehabilitation works of existing structures in their current form.

2. There can be no remaining permits sanding works for just the same reason. The only exception is the socket formed between the south coast last two epiurs Mangalia (President Hotel, Teilor Street), where you can accept a sanding 20m

3. There can be no allowed building works of new structures to defend the coast

In **MANGALIA POND** AREA is recommended not be used for sanding, sand or near the site of the ROSCA 0281 Cap Aurora. To reduce the negative impact of high turbidity waters, sanding or construction of dams to be done in good weather, calm sea, little wind (up to 2-3 Beaufort winds and high grade level 2-3 Douglas).

In AREA 2 MAY is required at the design stage, analyzing how best to achieve the repair works to existing structures to minimize the impact on biodiversity of the protected area. For works to the cliff, is required prior research on species and plant associations present here, to not destroy endangered plant species or halophilic arenicole. It recommends a 20m beach sanding for May 2 beach.

Concerning the proposed works of long-term implementation Master Plan (2021-2041) for **northern unit**, they will be implemented in the Danube Delta Biosphere Reserve. **Impact will be analyzed punctual at the beginning of the project itself.**

Measures to prevent / reduce and offset adverse effects on the environment during the execution of works - site organization

- fence enclosure site organization;
- equipping staff with appropriate protective equipment;
- maintaining strict rules of hygiene and work safety at work;
- prohibiting storage of materials or waste outside surfaces inside the site organization and in any case deposited in beach and cliff area near the site;
- prohibiting excavation of sand on the beach near the goal;
- transport and waste materials will be made only with suitable means of transport;
- waste management will be in strict accordance with the provisions of environmental legislation in force and it will be clear responsibility of the beneficiary or work, or general constructor but it will be clearly specified in the contract concluded between the two sides, on the works ;
- recommended that, during the development works in the marine environment protection and rehabilitation works contractor of the coastal zone to have a contractual relationship with a company specializing in remediation, the technical and human capability to have to intervene in the case including marine pollution (accidental loss of oil);
- It is forbidden to organize the site or any necessary temporary Spatial objective during construction in the beach area (on the one hand to protect the beach, on the other hand to limit any risk of migration in sea water or waste materials);
- rapid intervention in case of failure to remove the causes and mitigate the effects;
- the project organization works and rehabilitation of coastal protection, the manufacturer authorized to be appointed will perform its own environmental management system to prevent damage to the site;
- will be fully respected the MARPOL 73/78 requirements to which Romania adhered so that the project will not result in a significant impact on the marine environment in the area of development works;

- maintaining equipment and vehicles in good condition., revisions and maintenance in workshops;
- dumpers equipped with tarpaulins to cover the load during transport to reduce the amount of dust released into the atmosphere;
- permanent endowment working point suitable container storage and transportation of household waste and transport them to a regular in taking their authorized economic operator;
- provision of site water tank with spray device, used in case of fire and to reduce the amount of dust in the atmosphere;
- staff training on prevention and fire fighting, work safety and conduct in the vicinity of protected areas;
- prepare a schedule of work for transport, indicating the route, traffic speed and mode of transport of cargo;
- transport and storage of fuel and lubricants in suitable container for storage and transportation standards of oil products.
- the progressive, gradual project, eg coastal protection performance in a particular area of the coast and then move to another area, so that could have disturbed wildlife refuge in places where no work is performed.
- during execution of works will ensure strict monitoring of activities to avoid waste of fuel, oil, sewage in the aquatic environment;
- equipment operation must be done in conditions of maximum security, respecting the rules of operation provided by their technical books.
- full compliance with the order on site;
- compliance with established access roads (existing or newly created);
- compliance schedule to achieve planned works etc.

CHAPTER 9. Explanatory memorandum of option plan chosen, describe how the assessment was undertaken, any difficulties

9.1 Analysis of options :

In order to select options chosen for Master Plan were analyzed the following existing information :

- Erosion risk assessment for the situation without further intervention, presented in the Diagnosis of the Coastal Zone, part of the Master Plan.

- Interconnectivity between the coastal areas and taking into account coastal processes in relation to the receptors at risk of erosion, according to the description given in the Master Plan.
- It is taken into consideration the amount of sediment sources, storage areas and drainage and admits that almost the entire length of the Romanian Seaside has a large deficit of sediment, especially in the south part of it.
- Urgency character of rehabilitation and development of protective structures, taking into account both the level of protection as well as the remaining life, as shown in inventory and anthropic factors in expert report and summary report of the Coastal Zone Diagnosis Master Plan.

To avoid proposing new interventions in a location that will increase erosion process or to affect the sediment deposition in this areas, it is extremely important to take into account the effect of interventions on sediment movement and deposition. This was analyzed by numerical modeling, field studies and conclusions of the experts presented reports of field studies, reports and report diagnostic modeling of coastal sites is attached to the Master Plan.

Presenting specific Romanian coastal area based on field studies and numerical modeling was done through a strategic framework in which area split into two major units coastal morphologically and (7) seven sedimentrare cells that highlights the strategic intervention options that can be evaluated .

Coastal sediment cells are found along the coast area within which natural processes are relatively autonomous and have different sources, volumes of sediment transported and outputs (wells or deposits) of sediment.

Cell changes of sediment along the shore are generally independent of changes in the downstream and upstream cells, although, if there are partial limits for coarse sediment transport or when the limit is mobile, it is essential that the relationship to be considered in evaluation.

9.2 Methodology for assessing options rhythms Master Plan

For evaluating the options of Master Plan it was adopted a phased approach:

- **Phase I:** Evaluation strategy for the whole coastline, in order to choose the most appropriate of the four (4) strategic policies for

each sub-sector (without intervention, maintaining the line, controlled withdrawal and advancement of the line).

- **Phase II:** For sub-sectors for which strategic option without intervention is not considered appropriate:
  - taking into account state protection structures that already exist,the natural processes and the option risks without intervention, it will determine the appropriate intervention measures;
  - if necessary, sub-sectors will be divided into sub-divisions that will take into account state protection structures and erosion risks, in order to prioriza the nessesary interventions.
- **Phase III:** In order to establish the optimal alternative for two priority areas (Phase 2), it will be explored options with minimal investment, average and maximum costs and evaluation will be done using the sustainability criteria.

9.2.1 Presentation of options

This section focuses on possible options for management of the Romanian seaside, for the next 30 years.

The general options that could be applied to risk management for shoreline erosion over the next 30 years covered by this Master Plan are presented together with shoreline management. They can be applied to implement the strategy.

Strategic policy (strategy) of coastal management

As it follows, Four options are described that were used in the first stage of analysis of options for Master Plan, stage that is presented in the section below.

- **Without intervention (FI) or "zero option"** - where there is no investment in coastal protection structures and allows a natural evolution of the coast, without any control. Where no coastal protection works by this strategy allows, in fact, a natural evolution of the shoreline. Similarly, where the shoreline is now protected, existing protective structures will be maintained but will be allowed to further deteriorate until complete disappearance. This

means that areas near the coast and in the future will be subject to increased risk of erosion and / or flood the coast.

- **Withdrawal controlled (RC) or "Withdrawal" or "withdrawal line of defense"** - where the shoreline is allowed to move back in a controlled way to manage the risk of coastal erosion. This strategic option consider both building a new line of protection, and introducing measures to reduce erosion.
- **Maintaining the line (ML)** - where the risk of erosion is controlled by maintaining existing structures or building new ones, or by restoring existing ones.
- **Advancement (A)of the existing protection line** - where the risk of erosion is controlled by building new structures of protection to complement existing ones in order to reclaim land from the sea.

9.2.2 Intervention options - technical solutions

Heavy and light protection systems

In strategic management policies where the intervention is proposed (FI, RC, ML), there is a wide range of solutions and engineering techniques. However, much of the work light and heavy hydraulic works combine so as to meet the desired objectives.

Heavy protections typically include linear structures such as vertical walls of protection and concrete structures built along the shoreline. This protection is usually built at the foot of cliffs in order to achieve the promenade by the sea, or land reclaimed from the sea edge. Although there are many examples worldwide of heavy protection it is considered that the best practice is to adopt easy solutions, friendly environment. Protective dams lead to wave reflection andso it is increased beach erosion. Rough concrete dams in steps or with berme rockfill protection are more "friendly" environment because they can dissipate some wave energy, reducing the possibility of waves spill over structure and their reflection. The problem with heavy protections is that the wave energy reflection causes accelerated loss of sediment and erosion protection at the foot of dams. This leads to the need to build in future protection largest and most expensive. Loss of access to beaches and beach erosion caused by heavy protections also reduce the attractiveness of coastal tourism.

Light protections generally involve fitting or strengthening beaches as their use in coastal protection system. This can be done by sanding beaches, beaches process by which sediments are artificially restored in November, with or without beach protection structures. Protections may involve light and other techniques such as method of 'bypass' or recycling sand beach.

Beach protection structures are often used combined with light protections. Their goal is to create a more stable beach that differs from the existing one and is in active process of erosion. These mainly include the following:

- Large dams and wave smash artificial reefs;
- Spurs;
- Rockfill and epiuri protections;
- Combinations and variations of the above.

(A) (b)

Examples of (a) protection from rocks on the South Tomi, near the Casino and (b) light protection on the South Tomi, north of Tomis marina

The main objective of the Master Plan is to protect and rehabilitate the coast, so it is very important that the proposed technical solutions are not only considered acceptable solutions in terms of environment, they must really want to contribute to restoring and improving the environment. This requires options to work with, and not to act against natural processes to be as the "light".

Unit southern coast is a great shortage of sediment supply current ,without actual sediment alimentation.Developing technical solutions will require slight consideration of beach sandings and control structures, taking into account of the environmental problems of existing structures to protect the coast area.

To avoid or limit the effects of new buildings / structures on the environment, including control structures of the beach, a usual method and recommended best practice is to make sanding beach when construction of beach control structures. It is considered that a good way to build dams /

epiurs or control structures and to capture the current season to sanding bays, because we know that this cause an increase in erosion to downstream cells.

A good solution may include one or more of the items mentioned above and therefore life, investment costs, operating costs and maintenance costs will vary. The financial aspect is therefore an important consideration in making decisions.

9.2.3 Assessment of options

The evaluation of the hypothesis 'Without intervention'

This hypothesis was initially analyzed as a reference point, and later as one of four possible options for intervention that have been studied at the beginning of policy options in Stage 1 of development options and then in the analysis of Phase 3 of the multiple criteria in establishing technical solutions for areas of intervention.

The evaluation report made on the basis of diagnostic documents coastal zones is presented in table form segment divided between coastal and sub-sector referring. Assessment tables present information for each sub-sector summary of:

- coastal dynamics,
- nature and condition and remaining life for protective structures;
- erosion estimates for sub-sector, given the state of protection works,
- built environment, land use, transport infrastructure and cultural heritage
- protected environmental area (s) in the sub-sector and risks hypothesis without intervention.

These assessments take into account the problems and possible deterioration of the dislocation structures of protection, the impact of such policies without intervention in coastal processes, and natural and built environment.

Residual effects of coastal structures (assuming no intervention)

Lack of intervention implies an immediate termination of maintenance or design of existing structures, and no extra investment accomplished for new construction of protection the coastal area. As a result, existing protective structures will be allowed to degrade and fall. Many of the existing protective structures in Romania are now acceptable or unsatisfactory reporting to the

state of degradation and it is expected to fall in 10 years. Exceptions to this situation are those structures that were built in recent years and thus would be expected that they take almost all the way, if not the entire duration of the analysis of Master Plan. As part of the analysis undertaken for this report, where there is coastal protection, taking into consideration the estimated duration of operation was done before the advent of remaining erosion accelerated.

There is little protection structures along the coast of the Danube Delta protected in the Northern Unit of the Master Plan and analyzed so that the degradation of the structures would have an impact too low.

In the Southern Unit, where the number of protective structures is significant, degradation will have a big impact. A strategy to intervene not exclude the possibility of demolition of structures, except in case of danger to health and safety, and such structures would remain in position as it deteriorates. This would have the effect of maintaining artificial shoreline along almost the entire southern coast of units in the first few years after the implementation of such strategic policy, while the structures would continue to exercise influence on the coastal zone. In general, this influence is expected to decrease gradually until the structure will deteriorate to such an extent that in a sudden event have resulted in the effective collapse of this. An illustration of this point would be, for example, a dam-break wave that deteriorates until it breaks, or a dam-break wave of broad deteriorates and becomes ineffective after a storm. Once this happened, the structure is considered to be destroyed, since it no longer exert influence on the natural processes taking place at the coast.

Changes provided the coast and erosion risk areas

Where no protective structures constructed, no intervention is manifested by maintaining current conditions and natural processes. This is the case of almost all Nordic units, where the process takes place naturally. Sections along the coast that are currently stable or deposition process / growth from lack of intervention would be expected very few changes at the shore line. However, if the tendency to accumulate in the future are reduced or reversed, there is a risk of triggering erosion. If unprotected areas where erosion is an ongoing process, this process will continue in the absence of intervention. Effects are likely narrowing shoreline beach or withdrawal, depending on the nature bermei ridge, the risks of creating corridors in parallel with the shore sandbanks that characterize the Northern Unit and Southern part of the unit and associated effects on the hinterland. In the Northern Unit would result in increased risk they are exposed to significant freshwater environments and salt of the Danube Delta Biosphere Reserve.

Southern Unit is largely protected. Where there are individual structure to protect the coast and the southern end of May 2nd and Costinesti in Southern Unit and south pepu Jelly of the Sulina,

in the Northern Unit. Protective effect of destroying the structure would be located, together with sediment transport which were previously stored in upstream and there is an increased risk of flooding and erosion in the hinterland. After the destruction of the protective structure is expected to accelerate the process of erosion due to natural coastal proceselelor resume and shoreline will evolve towards a new equilibrium situation.

However, over a number of tourist areas in the Southern Unit, there are many coastal protection structures, which resulted in a situation of maintaining artificial shoreline. Since these structures are expected not to destroy the same time, they tend to be in a similar state and thus their degradation will occur about the same speed. In such situations, their influence will decline gradually as the processes taking place at the coast are repeated until they surrender. Following the destruction of the protective structure, we have a period of accelerated erosion until the shoreline is a natural position, with all the risks associated properties in tourist areas

Advanced critical erosion areas have been identified as the beaches of Mamaia, Tomis Nord, Eforie, Costinesti, between Olympus and Venus, Saturn and Mangalia Pond. These are locations that have been designated as critical areas, with a highly advanced erosion, the protective structures damaged and endangered properties in the hinterland area.

The effects of socio-economic level of the hypothesis without intervention

Most of the risks that target socio-economic aspects are concentrated in Southern Unit. Unit at the Northern hinterland is the most natural measure, low socio-economic areas endangered. However, southern coastal area includes many tourist resorts, cities and ports of Constanta and Mangalia. These areas are generally subject to erosion and many of them are critical erosion areas in an advanced stage. According to the hypothesis without intervention, existing protective structures would be left to degrade, which for most of them probably will happen in less than 10 years. As mentioned previously, this would result in a period characterized by an accelerated erosion process, as the shoreline responds, followed by a process of erosion continues. Along the largest side of the southern coast, protective structures are maintained over time in a position shoreline artificial sea properties built aa natural limit of the beach, or on land reclaimed from the sea for create areas of development. In these cases, accommodation and tourist facilities, residential areas, commercial property / industrial and transport routes are subject to greater risk as the coast continues to erode and protection structures to destroy.

There are plans to Corbu urban area, north of Tuzla, Costinesti, 23 August and between May 2 and Vama Veche. In these areas there is also an identify risk for all planned developments under these plans.

In many parts of the coastal zones of Romania, the beach itself is also a good socio-economic, attracting tourists in the area and providing various facilities. While accepting the destruction of protective structures would have an effect on sand beaches, maintained the position of these structures, disappearing rapidly accelerated erosion conditions and reduction of beach width.

Phase I Evaluation of options - Establish strategic policy
Approach and detailed information on options

The overall objective of the Master Plan is to stop or control coastal erosion, protect and improve environmental quality and increase the safety and living standards along the Romanian coast.

To achieve this objective, in the context of integrated coastal zone management, Master Plan should:

- identify areas at risk of coastal erosion;
- causes of erosion;
- establish and prioritize structural and non-structural measures to prevent erosion;
- to combat the effects of erosion.

The first step in identifying strategic policy was to consider the adequacy of the four alternatives for each sub-sector, namely: Without intervention, controlled withdrawal, maintenance and advancement of the line protection line.

Appropriate strategy for management option for an area will depend on several factors, including the nature of the risk, the property / properties at risk, environmental effects, the benefits and costs and management objectives for the area.

Without intervention (FI)

This implies that strategic choice where protection structures are present, they will not be maintained continuously and will left to degrade up to destruction. Duration of destruction depends on the structure and degree of exposure. Where no coastal protection, for example along the line most of the natural shoreline Unit Northern FI strategy may be considered appropriate. In such cases, it is assumed that there is no change in this situation and that actual modification of the coast continues, unless it is affected either by changes along the section near the coast, or changes in the factors the environment.

FI version will not be an appropriate alternative where formations of the coast are at risk of erosion.

Withdrawal controlled (RC)

This policy involves some form of human intervention in order to control the possible future shoreline movement. Unlike shoreline maintenance strategy, in this case-RC- the current shoreline position is not fixed by heavy protective structures. Instead, it allows natural processes to continue or be restored to some extent. How to implement this strategy varies from one area that are being implemented.

For sections of coastal erosion where there is currently no natural protection structures, controlled exit strategy may be related to the use of soft protection options designed to slow rather than prevent natural erosion. This category could include measures such as beach restoration, remodeling or restoring natural beaches of the coast, to slow or delay the process of erosion. RC option might be considered appropriate for short-term solution, in areas of environmentally sensitive, where the construction of heavy structures is not appropriate.

RC implementation strategy often requires study and consultation and could be at risk of substantial investment costs for construction and that of some asset relocation costs. However, RC strategy often can provide long-term sustainable solution.

Along the cliffs, RC policy typically involves the use of measures to slow the erosion, and consolidation at the coast or the use of low-life structures such as gabioanele. The intent of application these measures is to slow down, rather than to prevent erosion and therefore, unlike the ML strategy, there is no certainty regarding the standard of protection. This approach could be appropriate in places where the construction of protective structures not bring too many benefits in terms of economic, but where a temporary protective structure can provide the time needed for physical property erosion on beaches to be relocated. In such situations, this policy should be applied with caution because it may give false hope of long-term protection, although it is likely that this is not the most sustainable solution.

Maintaining shoreline (ML)

Policy involves maintaining shoreline maintenance and improvement (as needed) existing protective structures or building new structures along the shore line current. The intention is to provide a certain level of protection beyond the property line of protection, flood risk and / or erosion.

Implementation of this strategy may involve heavy protection solutions and / or light. Given the fact thae this policy is based on the idea that will stabilize the shoreline, there are implications in terms of long-term sustainability and negative impact on surrounding areas, implications to be considered. This strategy typically involves high costs of investment and / or maintenance and therefore there must be sufficient benefits to justify socio-economic choice and its promotion. Consequently, this policy is particularly recommended in areas with high economic value, especially where it involves the construction of hard protection structures. In addition, it is possible that the same strategy to be appropriate along the beach that borders the freshwater areas, ecologically important, where there is permanent concern about potential flooding with salt water of these areas, but using lightweight structures.

Advancing existing line protection (AL)

The strategy involves advancing line of protection for the building of new structures of protection beyond existing protection structures seaward limit of the coastal zone. The policy does not include sanding beaches or building large dams burst-wave, because such measures are used with the intention of preserving a beach and are included in the option "maintain shoreline."

In most areas, this policy may have a significant impact on coastal dynamics, both locally and at the level of cell sedimentation. Therefore, it is not recommended for erosion along the beach or where there are protected areas. The cost of implementing this option is usually high, therefore it must generate a large enough potential economic benefit. Therefore, this policy is usually applied only in coastal regions where either there is no likely impact on the adjacent shoreline, or can be identified some major economic benefits.

Over the Romanian coast, this strategy has been considered only in the ports potential opportunities where existing port structures have an impact already. Elsewhere, the trend of erosion of sedimentary material shortages coast and along the shoreline, along with high value in terms of environment, especially in the Northern Unit, lead to the conclusion that the advancing line of defense policy is not one right.

Preferred strategy of the Romanian coastal zone

Evaluation results are summarized in table strategic synthesis in Appendix D of the Master Plan. The table includes a summary of information on risk assessment of erosion protection structures present status and score four strategies, calculated on the basis of a system of check marks and X's in terms of impact, risk assessment strategy with no intervention .

Phase II Evaluation of options - Prioritize areas for intervention

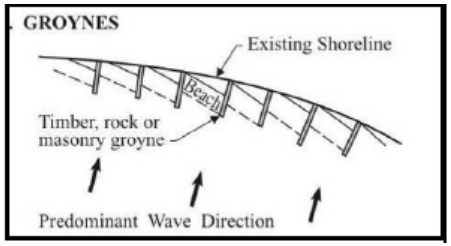
Phase II evaluation of options included two key steps:

- Selecting appropriate intervention options, step have been taken into account the type of protective structures where this exist, natural processes of erosion and risks without intervention strategy.
- Prioritizing areas of intervention. In some locations it was necessary to further the division of sub-sectors in areas, division that account for state protection structures and erosion risks.

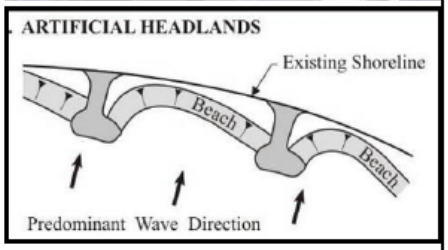
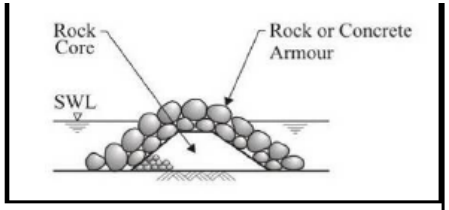
Evaluation of potential technical solutions identifyed in Phase II requires particular attention to the types of technical solutions that may be suitable locations in which the preferred strategy is either maintaining shoreline or controlled withdrawal.

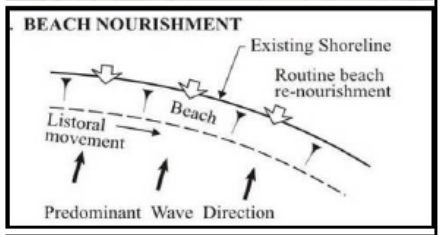
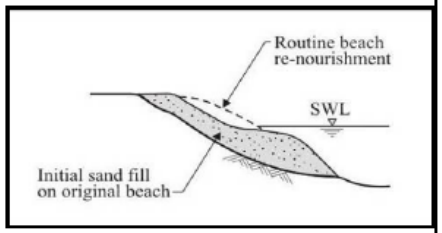
Potential technical solutions are presented in Table 9.2.1.

Groynes  	Groynes are shoreline control structures, located perpendicular to the shore, crossing part of, or the entire, littoral zone. They can be constructed from various materials. Groynes impede the long-shore drift, causing sediment, resulting in accumulation of sediment on the updrift side of the groyne. In order to minimise the down-drift erosion effect typical of these structures, these should be utilised along coastlines where the net transport is low but the gross transport is high, i.e. there is transport in both directions that will mitigate some of the downdrift effects in the net transport direction. They may also be designed to allow transport once the groyne bays are filled. Groynes are traditionally designed as one part of a coastal erosion risk management scheme, normally in	They can be very effective at retaining a beach, is the most effective form of sea defence, as it has the ability to adapt naturally to changes in wave conditions and to dissipate wave energy. Rock groynes have the advantages of simple construction, long-term durability and ability to absorb some wave energy due to their semi-permeable nature. Variable levels of protection can be provided along the frontage.	Although groynes encourage upper beach stability and reduce the maintenance commitment for recycling or recharge, they still disrupt the natural nearshore processes, potentially creating downdrift erosion if an adequate level of maintenance is not provided. The lifespan of groynes depends upon the material used in construction, with rock groynes having a longer lifespan. They can impede watersports and some beach activities and are also a potential hazard if climbed upon. They have a high visual impact and can totally alter the natural planform of a stretch of shoreline.

GROYNES  	combination with beach recharge, but can also be used in combination with a revetment or vertical wall.		
Offshore breakwaters 	Detached breakwaters (also known as reefs) and submerged breakwaters are distinct from groynes as their principal purpose is to alter the nearshore wave direction and energy, to create an environment conducive for sediment deposition, rather than simply retaining sediment. These structures tend to be suitable for beaches where cross-shore transport is a key process. A salient, or pocket beach, is the characteristic evolution of the shoreline in the lee of the structures. If the salient reaches the structure, a tombolo forms; this can then act, in	If properly designed these structures can be an effective way to either hold a recharged beach or stabilise an existing beach. Variable levels of protection can be provided along the frontage. Submerged breakwaters encourage marine life; they can provide habitat for shellfish with potential advantages for water quality and sediment supply.	They need to be carefully designed otherwise they can: -induce hazardous rip currents which, in some cases, can encourage the loss of sediment through the gaps between the structures, deepening the seabed at those locations; -cause water quality issues due to stagnant water; -promote the deposition and accumulation of fine sediment and flotsam; -adversely affect the nearshore transport of sediment and therefore impact on downdrift

	combination with the breakwater, as a groyne; thereby affecting littoral transport along the beach. Offshore breakwaters may be surface piercing or, where less shelter is required, submerged. Another form of detached breakwater is the Artificial Reef. These are sometimes constructed from alternative or recycled materials and the purpose may be to provide habitat or to improve surfing conditions.		areas. Offshore breakwaters can also be visually intrusive. They require time to design properly and can also be difficult and costly to construct because of their position offshore. They are also a potential hazard to vessels and bathers.

Rock headlands and shore connected breakwaters   	Artificial rock headlands and shore-connected breakwaters can create stable pocket beach formations by modifying the incoming wave climate between adjacent structures. They are generally positioned along frontages where the net long-shore transport is limited and are commonly used to maintain artificially replenished beaches.	If well designed they can be used to create or maintain good amenity beaches in areas where a combination of longshore and cross-shore control is needed. They tend to have a long design life and Variable levels of protection can be provided along the frontage. They can be used to create better amenity beaches and the structures can be designed to also function as promontories with walkways.	Artificial rock headlands and shore-connected breakwaters tend to be significant rock structures with a large footprint; they therefore have a high visual impact. They tend to have large capital costs, and will still require some maintenance to ensure no rock movement They can impede watersports and some beach activities and are also a potential hazard if climbed upon. They may cause leeward deposition of fines and flotsam, which has both ecological and beach quality impacts.
 Diagrams taken from Fleming and Reeve (2005)			There is limited design guidance currently available. They can cause downdrift erosion issues.

Option	Description	Advantages	Disadvantages
Beach recharge with sand     Diagrams taken from Fleming and Reeve (2005)	Beach recharge is a 'soft' coastal defence solution. Sediment is placed on the beach, sourced from outside the sediment cell, either from an offshore site, from land based quarries or river beds. Beach recharge can be implemented on its own or in combination with other options such as erosion control structures (e.g. groynes) to retain the new beach material. This depends upon the dynamic nature of the shoreline in question. Beach recharge can also be used in combination with artificial recycling to counter alongshore losses. Beach recycling is an operation, typically with excavators and dumper trucks, to transport beach material that has been transported downdrift back to an updrift location in the same sediment cell. It is very important to select appropriate sediment grain size and mineralogy for the project site, which should normally be coarser or similar to the naturally occurring material at the location.	It has the advantage of re-establishing a 'natural' beach, which is the most effective form of sea defence, as it has the ability to adapt naturally to changes in wave conditions and to dissipate wave energy. This solution is less likely to cause erosion problems downdrift than other engineering solutions. It offers up a more environmentally acceptable use of natural material. This solution can be used to increase beach space and create amenity areas. It may enhance coastal habitats for plants and animals. It does not limit future options for management of the coastline.	Erosion of the beach will continue if natural sediment supply is restricted, therefore, further beach replenishment may be necessary in the future. It may alter beach quality and morphology with potential introduction of non-native beach material, which may differ in colour, mineralogy or texture. Environmental impacts at dredging source site needs careful consideration. Potential impacts on other coastal communities also need to be considered. There may be difficulty in sourcing new material in the future, either due to availability or cost. It may be difficult to convince locals that this is an adequate and long-term solution.

Option	Description	Advantages	Disadvantages
Sand bypass 	Sand bypass is a special measure to solve the problems of siltation at the entrance of ports or inlets and of related beach erosion at the down-drift side. Sand is dredged from the up-drift side and transported to the down-drift side through a pipeline, by a hopper dredge, or by dump trucks. It is a site-specific solution and normally only applied where there are long shore-perpendicular structures that have interrupted the natural longshore drift.	It can be a relatively low cost solution in comparison with other options, e.g. building a new sea wall or the having to find new sources of sediment for recharge. It reinstates natural littoral links and mitigates the environmental impacts of port structures and training walls / jetties. It involves the relocation of naturally occurring beach sediment so there are no issues with the sediment type or grade. There is potential to create new habitat through improved beaches downdrift. Used in conjunction with other solution it can help prolong the lifespan of a scheme.	Depending on the technique applied there is potential disturbance to benthic communities. It may affect sediment circulation and excessive recycling may cause problems in the source areas. To be effective, the dredged material needs to be placed in the right location. Due to variability in longshore drift rates, operations need to be flexible. There is a long-term commitment as needs to be repeated at regular intervals; therefore there are potentially significant operation costs.

In cases where the preferred strategy is without intervention, management options sub-sector has not been analyzed. These technical solutions include some types of protective structures presented in previous sections.

It should be noted that not all sub-sectors covering locations complete and that some sub-sectors have more locations. This is established by state protection structures and in some cases, the location of previous feasibility studies prepared for some sites.

Investment program will take into account also some specific issues such as the proposed infrastructure, beneficiaries measures, time and implementation costs, maintenance and operating costs.

In Phase II, to determine priority intervention areas was taken into account the following factors:

- environmental risks for application without intervention strategy;
- state structures and beaches of coast protection and their effectiveness;
- human health and safety risks;
- time required to develop technical solutions, including feasibility studies and reports of environmental concerning impact assessment.

A summary of the priority areas of intervention and is found in the table below. It should be noted that the list of priority projects and only include sites that are likely to options sanding beaches short term, be necessary to preserve beaches reinnisipari and medium and long term. This is not because the locations are part of the site will be the same.

The two down figures presents a summary of the chosen strategies:

Figure 9.2.3.1 Summary of preferred strategies for NorthernUnit

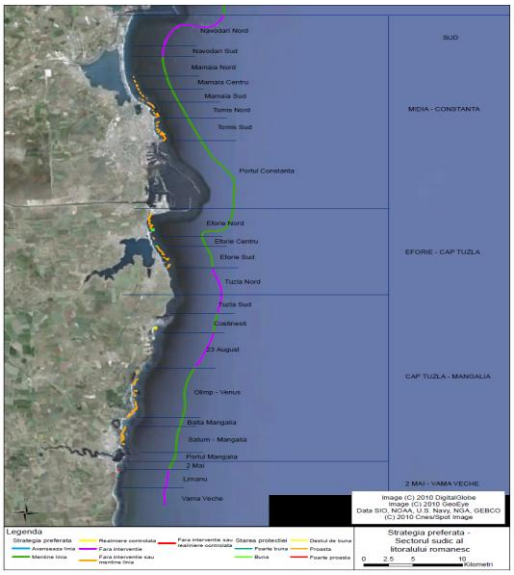


Figure 9.2.3.2. Summary of preferred strategies for Southern Unit

Table 9.2.3.1.Lista of priorities for intervention projects:

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Sediu Central Târgovişte: Str. I.H.Rădulescu, Nr. 3-5, Mun. Târgovişte, Jud. Dâmboviţa, România, 130010, Tel: +40 245 606 150, Fax: +40 245 210 852
Bucureşti: Str. Nicolae Caramfil, Nr. 87, et.3, sector 1, România, 14146, Tel: +40 31 437 01 24, Fax: +40 31 437 01 18
Constanţa: B-dul Tomis, Nr. 143 A, et. 8, Mun. Constanţa, Jud. Constanţa, România, 900591, Tel/Fax: +40 241 481 410

Priority	No.	Project name	Major Coastal Unit	Coastal Sedimentation Unit	Sub Sector	Location	Shoreline protection	Offshore breack-waves dams	Groynes	Beach recharges	sand "by pass"
Short Term	1	Mamaia Sud	Sudica	Golful Mamaia - Cap Midia to Portul Constanta	south Mamaia	Hotel Melody - Pescarie	✗	✓	✓	✓	✗
	2	Tomis Nord	Sudica	Golful Mamaia - Cap Midia to Portul Constanta	North tomis	Pescarie - Strada Havana	✗	✓	✓	✓	✗
	3	Tomis Central	Sudica	Golful Mamaia - Cap Midia to Portul Constanta	North tomis	Strada Havana - Strada Renasterii	✗	✓	✓	✓	✗
	4	Tomis Sud	Sudica	Golful Mamaia - Cap Midia to Portul Constanta	SouthTomis	Strada Renasterii - Tomis Touristic Port	✗	✓	✓	✓	✗
	5	Eforie Nord	Sudica	Eforie - Cap Tuzla	North Eforie	Steaua de Mare - Hotel Belona (Touristic Port)	✗	✓	✓	✓	✗
Mid Term	1	Canalul cu Sonda	Nordica	Sulina Jettey on the South end of Scalin Island (Zatoane)	Canalul cu Sonda	Canalul cu Sonda	✗	✗	✗	✓	✓
	2	Portita	Nordica	Zatoane - Port Midia	Portita	Gura Portitei	✗	✗	✓	✓	✗
	3	Mamaia Nord	Sudica	Golful Mamaia - Cap Midia to Constanta Port	North Mamaia	Limit between Navodari and Mamaia - Hotel Rex	✗	✗	✗	✓	✗
	4	Mamaia Centru	Sudica	Golful Mamaia - Cap Midia to Constanta Port	Mamaia Centru	Hotel Rex - Hotel Melody	✗	✓	✓	✓	✗
	5	Tomis Port - Constanta Port	Sudica	Golful Mamaia - Cap Midia to Constanta Port	South Tomis	Tomis Port to Constanta Port	✓	✗	✗	✗	✗
	6	Agigea	Sudica	Eforie - Cap Tuzla	North Eforie	Digul Agigea to Steaua de Mare Hotel	✗	✓	✓	✗	✗
	7	Eforie Centru	Sudica	Eforie - Cap Tuzla	Middle Eforie	Middle Eforie Vraja Marii - International Camp	✓	✓	✓	✓	✗
	8	Eforie Sud	Sudica	Eforie - Cap Tuzla	South Eforie	International Camp - South Eforie Pescarie	✓	✓	✓	✓	✗
	9	Costinesti Sud	Sudica	Cap Tuzla - Mangalia	Costinesti	South from dischard of the lake of Albatros Vila	✓	✗	✓	✓	✗
	10	Olimp	Sudica	Cap Tuzla - Mangalia	Olimp - Venus	Maramures Hotel to Garofita Vila	✓	✓	✓	✓	✗
	11	Neptun	Sudica	Cap Tuzla - Mangalia	Olimp - Venus	Neptun Jettey	✗	✓	✓	✗	✗
	12	Jupiter - Venus	Sudica	Cap Tuzla - Mangalia	Olimp - Venus	Tismana Lake to Silvia Hotel	✓	✓	✓	✓	✗
	13	Saturn - Mangalia	Sudica	Cap Tuzla - Mangalia	Saturn - Mangalia	Hotel Cerna to Hotel Diana (Saturn); Hotel Mangalia	✓	✓	✓	✓	✗
	14	2 Mai	Sudica	02 Mai - Vama Veche	2 Mai	Mangalia Port South Dam - 2 Mai	✗	✓	✓	✓	✗
Long Term	1	Jetele Sulina	Nordica	Delta Chilia (Ucraina) - Sulina Jettey	Golful Musura	Sulina Jettey and addiacent areas	✗	✗	✗	✓	✓
	2	Gura Portitei	Nordica	Zatoane - Port Midia	Portita	Gura Portitei	✗	✗	✗	✓	✓
	3	Stavilar Periboina	Nordica	Zatoane - Port Midia	Periboina	Stavilar Periboina	✗	✗	✓	✗	✓
	4	Stavilar Edighiol	Nordica	Zatoane - Port Midia	Chituc	Stavilar Edighiol	✗	✗	✓	✗	✓
	5	Balta Mangalia	Sudica	Cap Tuzla - Mangalia	Pond Mangalia	Silvia hotel- Cerna Hotel	✗	✗	✗	✓	✗

Figure 9.2.3.3 Location of intervention projects in Northern Unit

Figure 9.2.3.4 Location of intervention projects in Southern Unit

Phase III Evaluation of options - Develop and evaluate options
Methodology

If the areas for which measures have been proposed Phase II intervention (as opposed to cases where the chosen solution without intervention) were developed options for low, medium and high intervention (ie options minimum, average and maximum) . Options were proposed for each sub-section, and where intervention projects have been proposed small-scale sub-sectors were divided into smaller areas. It is important to note that these options are options considered initial (preliminary), which, after careful consideration of the Master Plan of the SEA, could move to the stage of feasibility studies, to prepare detailed proposals.

In Phase III, the proposed preliminary options for all versions of intervention (no intervention, minimal intervention, average and maximum) were subjected to a multi-criteria analysis based on 13 environmental objectives, social and economic development for the duration.

Multi-criteria evaluation matrix applied is shown in the table below. Preliminary assessment of options was scored according to a system to show if that option is likely to meet objectives (for example, to reduce the problems identified in the case without intervention) or not, on a comparative scale from 1 to 3 for the degree of fulfillment targets, where they think that the different level of impact.

For factors that could contradict the objectives or where some objectives can be met and others not (eg if competition between terrestrial and marine protected sites) is given a score neutral as neutral score is also given in the case objectives considered inapplicable to a particular sub-sector or a particular option. For this multi-criteria approach, the score for the economic criterion was made subjectively, using a comparative assessment of options.

It should be noted that this is a preliminary analysis, its purpose being to help to understand at the outset of the likely impact of each option and allow discussing with interested parties. Following approval of the Master Plan will be developed feasibility studies for each area (project) in hand surgery.

Table 9.2.3.2 Parameters of multi-criteria analysis for preliminary analysis of options

Area of sustainability	Assessment category
Environment	Working with natural processes / impact on coastal dynamics.

	Coastal habitat restoration
	The possibility of improving water quality (assistance in meeting WFD objectives)
	Protection of cultural heritage
	Important project in terms of environmental objectives for land use plans
	Important project in terms of meeting the objectives for protected sites (Natura 2000, Biosphere etc.)
Social	Number of properties / houses protected
	Improving the level of safety for individuals and communities
	Protection or creation of employment opportunities of workers
	Infrastructure protection and business communities
Economic	Present value of project costs (investment and maintenance costs)
	Potential to generate business opportunities
	Potential to generate income at the national / regional nivel

Minimum, average and maximum investment options :

Minimum intervention option is, in most cases, a minimal solution that could be implemented to reduce the risk of erosion and improve public safety issues. However, most times, minimal intervention is not able to restore beaches, as the average lost substantial value.

Objectives and selecting the appropriate

After evaluating options based on high level sustainability criteria, was selected an appropriate preliminary option for each area of intervention in part.

Evaluation of multi-criteria options was based on evaluation factors in pile environmental, social and economical sustainable development, as was specified in the table above.

Following this assessment a preferred option was selected, in accordance with the Master Plan's goals to protect and improve environmental quality and standard of living and to increase public safety, especially in the Southern Unit, where protective structures is in poor condition and much

of the coastline is affected by erosion. Because environmental conditions are improving key criterion Master Plan has not paid particular attention to economic issues that you would require an option or another. The method of choosing the preferred option used a two-stage approach:

- Options were classified according to environmental objectives met, without taking into account the degree to which they had been met. Were two of the priority objectives - "The potential for water quality improvement (assistance in meeting WFD objectives)" and "The importance of the project in terms of meeting the objectives for protected natural sites."
- Following this initial classification were assessed socio-economic objectives, with particular emphasis on improving the safety population.

Preferred options are summarized in the following (Table 9.2.3.3), together with some brief comments on the rationale for selection of certain options for each area separately.

Table 9.2.3.4.Appropriate option for Romanian coastal

Sub-sector	Area of intervention (project location)	Preferred option		
		Intervention option (minimum / medium / maximum)	Brief description of the option chosen	Justification (Key factors in choosing)
Laguna Musura	Sulina Canal, and the adjacent arm Jetelele north (to alleviate the problems of erosion in the channel probe)	Low	by-pass periodic sediments in the northern part of Sulina Canal structures or from maintenance dredging and placement Sulina Canal sub-sectors Sulina and / or channel probe.	• Environmental objectives, including objectives of protected natural sites; • Medium and maximum options do not meet in the protection of infrastructure, loss or damage due to canal navigation; • Allows the accumulation of sediment for the preferred option for the probe channel.
Channel probe	Channel probe	Low	Shore power by downloading off the beach submerged dredged sediments.	• Environmental objectives, including objectives of protected natural sites;

				• Meets the environmental objectives in a greater extent than other objectives; • Protecting infrastructure; • Impact on socio-economic objectives, or with other options. • Intervention options on the beach are likely to be acceptable minimum level designated internationally important sites.
Gate	Portitei mouth (Local protection structures for beach tourism)	Average	Beaches sanding width of 15 m and repairing existing structures	• Performance with the higher proportion of environmental objectives, including targets protected sites; • Neutral score improve water quality, compared with maximum intervention option that does not support; • Insignificant intervention area compared to sub-sector and parallel to shore sandbank something wider, and the option will have only a local impact on the shoreline; • Meets all socio-economic objectives, including the safety of people and communities. • The protection extended structures is not likely to be acceptable in terms of environmental protected areas.
Periboina	Dam adjacent to Periboina (options related to dam itself was not considered)	Maxima	Management entrance	• Meets targets for habitat restoration, while the other two options do not meet the intervention; • Meets objectives for protected areas while the other two options do not meet intervention • Meets health and safety objectives
Chituc	Dam adjacent to Edighiol (options	Maxima	Repair existing epiurilor entry and management	• Neutral impact on improving water quality and coastal habitat

	related to dam itself was not considered)			restoration. The other second option did not meet; • Meets the socio-economic objectives including improvement of health and safety and protection of property and infrastructure.
North Mamaia	North Mamaia	Average	Sanding with a sand beach, 60 m in width	• Meets most environmental objectives, including objectives of protected natural sites; • Lack structures maintain wild character of the beach; • Meets all socio-economic objectives, including the health and safety of the population, as well as the protection of property and infrastructure.
Mamaia center	Mamaia center	Maxima	Construction of new dams stability of the beach / pier break-wave of rock and performing sanding work of the beach, 60 m in width	• Meets most environmental objectives, including those on water quality objectives neutral score of protected natural sites; • Meets all socio-economic objectives, including those on health and public safety and those relating to protection of property and infrastructure.
South Mamaia	South Mamaia	Maxima	Rehabilitation, improvement and construction of new protection structures with beach sanding	• Option promoted as part of the feasibility study for priority areas. • Significantly better scores in all socio-economic objectives, including in terms of health and safety. • The choice of minimum intervention would not meet all criteria for health and safety.
Tomis Nord	Tomi Tomi North and Central	Maxima	Renovation, improvement and construction of new protection structures with artificial beach sanding	• Option promoted as part of the feasibility study for priority area. • Meets most environmental objectives. • Includes potential to improve

				water quality. • Significantly better scores in all socio-economic objectives, including in terms of health and safety.
South Tomi	South Tomi to the Hotel Palas	Maxima	Rehabilitation, improvement and construction of new protection structures and beach sanding	• Option promoted as part of the feasibility study for priority area.
	From the Hotel Palas Constanta port until	Maxima	Building a new structure cliff foot building to replace the existing one and provide additional protection	• Given the nature of the intervention area, few options fail to meet environmental objectives; • Meets most of the key socio-economic objectives, including the improvement of safety and protection of property and infrastructure.
North Eforie	For the dam break wave Agigea to Great Star	Maxima	Rehabilitation, improvement and construction of new protection structures with beach sanding	• Meets most environmental objectives in a greater extent than other options; • Includes potential to improve water quality; • Meets all key socio-economic objectives, even to a greater extent compared to other options, including in terms of improving safety levels.
	From sea to Hotel Star Belona (tourist port) (North Eforie)	Maxima	Rehabilitation, improvement and construction of new protection structures with beach sanding	• Option promoted as part of the feasibility study for priority area; • Includes potential to improve water quality; • Significantly better scores for socio-economic objectives, including in terms of health and safety; • Intervention option does not meet all the criteria of minimum health and safety.
Eforie-	Eforie - Central Zone	Low	Without repairs to existing	• Greater extent fulfillment of

central area			structures. Frequent sanding beach.	environmental objectives, including targets protected sites; • Socio-economic objectives, including those on property and infrastructure protection; • The introduction of new control structures of the beach in an area sensitive to the environment is not likely to become an acceptable solution in this regard.
South Eforie	South Eforie	Maxima	Rehabilitation, improvement and construction of new protection structures with beach sanding	• Fulfillment of environmental objectives, including the potential to improve water quality - an existing problem at the moment. • Meets all socio-economic objectives, including protecting the property and to improve safety levels.
Costinesti	Guidance from the lock wall to the south of Lake Villa Albatros (Costinesti South)	Maxima	Rehabilitation, improvement and construction of new protection structures with beach sanding	• Meeting the environmental objectives, including potential water quality improvement; • Meets all socio-economic objectives, even to a greater extent than other options, including regarding the protection and improvement of safety properties.
Olympus - Venus	From the Hotel Maramures to Garofita (Olympus)	Maxima	Rehabilitation, improvement and construction of new protection structures with wider bays and beach sanding.	• The fulfillment of environmental objectives, including potential water quality improvement; • Neutral score goals on protected sites; • Sanding in the absence of structural improvements can be a successful option than short term; • Fulfilling all socio-economic objectives, including in terms of protecting property and improve safety.
	Neptune Epiul	Low	Reabiltarea and improve the existing structure	• Environmental objectives, including the potential to improve

				water quality - an existing problem at the moment; • Socio-economic objectives, including increasing the level of safety.
	From Lake to the hotel Slivia Tismana (Jupiter - Venus)	Maxima	Rehabilitation, improvement and construction of new protection structures with wider bays and beach sanding.	• Environmental objectives, including the potential to improve water quality problem exists at present; • Sanding beach in the absence of structural improvements can be a successful option than short term; • Meets all socio-economic objectives, including increasing the safety measures, and even a greater extent than other objectives.
Pond Mangalia	Pond Mangalia	Maxima	Sanding beach: 60m width, length will be determined in SF	• Environmental objectives in a greater extent than other options; • Meets objectives of protected natural sites; • Fulfilling all socio-economic objectives, even in a greater extent than other options; • The introduction of new control structures of the beach in an area sensitive to the environment is not likely to become an acceptable solution for its protection.
Saturn - Mangalia	From Hotel Cerna to the Hotel Diana (Saturn)	Maxima	Rehabilitation, improvement and construction of new protection structures with wider bays and beach sanding.	• The fulfillment of environmental objectives and to a greater extent than other options; • Fulfilling the potential to improve water quality problem presently existing, neutral score goals on protected sites; • Fulfilling all socio-economic objectives, even in a greater extent compared to other options.

	From Diana to the dam Mangalia Hotel North (Mangalia)	Maxima	Construction of new protection structures with wider bays and making a sanding of the beach, 20m in width	• The fulfillment of environmental objectives and to a greater extent than other options; • Fulfilling the potential to improve water quality - an existing problem at the moment; neutral score goals on protected sites; • Fulfilling all socio-economic objectives, even in a greater extent compared to other options.
May 2	May 2	Low	Rehabilitation of existing structure	• Score neutral in terms of improving water quality, other options do not meet the required score; • Key socio-economic objectives, including those on the level of safety for individuals and communities. • Sanding options can not be a beach acceptable solution in the vicinity of sensitive marine sites in terms of environment.

CHAPTER 10. Measures for monitoring significant effects of implementing the plan

Sub-sector	Area of intervention (project location)	Preferred option		
		Strategic Option	**Brief description of the option chosen**	**Monitoring measures**
Laguna Musura	Sulina Channel, Jetele and the adjacent north arm (to atenute the problems of erosion in the channel probe)	FI	The sediments periodic By-pass in the northern part of Sulina Channel structures or dredging from the maintenance of Sulina Channel and the placement in the Sulina Channel and sub-sectors of Sulina and / or channel probe. Solutions will be completed by further studies and chosen solutions will take into account the recommendations of the Management Plans ROSCI0065 of the Danube Delta and ROSPA0031	**Estimated sedimentation dynamics modeling to obtain the downstream sector by pass;** • **Monitoring by measurements of the line beach and the bathymetry of real effects** • **The adjustment of the model based on the results of field and adjusting technical solutions to achieve desired**

			Razim-Sinoe Complex areas.	**outcomes**
Probe Channel	Probe Channel	FI	Shore power by downloading submerged dredged sediments off the beach.	• **Estimated sedimentation dynamics modeling is obtaining by the bypass in Probe Channel sector.** • **Monitoring by measurements of the line beach and the bathymetry of real effects** • **Adjustment model based on the results of field and adjusting technical solutions to achieve desired outcomes**
Portita	Portita Mouth (Local protection structures for beach tourism)	RC	Beaches sanding width of 15 m and repairing existing structures	**Monitoring annual by measurements of the line beach and the bathymetry of real effects**
Periboina	the adjacent dam from Periboina (options related to dam itself were not considered)	RC	Management entrance Solutions will be completed by further studies and chosen solutions will take into account the recommendations of the Management Plans ROSCI0065 of the Danube Delta and ROSPA0031 Razim-Sinoe Complex areas	**Monitoring annual by measurements of the line beach and the evolution of the submerged bathymetry of the beach.** • **Monitoring direction, flow and current intensity of communication between Sinoe lagoon and the sea**
Chituc	The adjacent dam to Edighiol (options related to dam itself were not considered)	ML	The repairing of the existing epiurs and of the managment entry . Solutions will be completed by further studies and chosen solutions will take into account the recommendations of the Management Plans ROSCI0065 of the Danube Delta and ROSPA0031 Razim-Sinoe Complex areas.	**Monitoring annual by measurements of the line beach and the evolution of the submerged bathymetry of the beach.**
North Mamaia	North Mamaia	ML	Sanding with a sand beach, 60 m in width	• **Monitoring annual by measurements of the line beach and the evolution of the submerged bathymetry of the beach** • **Monthly monitoring of bathing water quality;** • **Annual monitoring of the evolution of benthic fauna.**
Middle Mamaia	Middle Mamaia	ML (U)	Construction of new stability dams of the beach / break-wave of rock and performing sanding work of the beach, 60 m in width	• **Monitoring annual by measurements of the line beach and the evolution of the submerged bathymetry of the beach.** • **Montly monitoring of bathing water**

				quality; • Annual monitoring of the evolution of benthic fauna.
South Mamaia	South Mamaia	ML (U)	Rehabilitation, improvement and construction of new protection structures with beach sanding	• Monitoring annual by measurements of the line beach and the evolution of the submerged bathymetry of the beach. • Monthly monitoring of bathing water quality; • Annual monitoring of benthic fauna evolution ..
Tomis Nord	North Tomis and Middle Tomis	ML (U)	Renovation, improvement and construction of new protection structures with artificial beach sanding	• Annual Monitoring the measurements of the line beach and the evolution of the submerged bathymetry of the beach • Monthly monitoring of bathing water quality; • Annual monitoring of the evolution of benthic fauna.
South Tomi s	South Tomis to the Palas Hotel	ML (U)	Rehabilitation, improvement and construction of new protection structures and beach sanding	• Annual Monitoring the measurements of the line the beach; • Monthly monitoring of water quality • Annual monitoring of the evolution of benthic fauna.
	From the Palas Hotel until Constanta Port	ML (U)	Building a new structure cliff foot building to replace the existing one and provide additional protection	• Water quality monitoring; • Annual monitoring of the evolution of benthic fauna.
North Eforie	Agigea - For the break wave dam of Agigea to Steaua de Mare	FI/ / ML (U)	Alternative solutions: 1. No intervention in the area; 2.identificarea technical solutions leading to natural accumulation of sand in the area.	• Mapping habitat distribution from 1170 to 1110 • Monitoring the population dynamics of Pholas dactylus before, during and after the works • Monitoring of sediment migration in the area after sanding.
	Eforie North - From Steaua de mare to Hotel Belona (tourist port)	ML (U)	Rehabilitation, improvement and construction of new protection structures with beach sanding	• Mapping of species distribution and Donax trunculus Donacilla cornea before work

				• **Monitoring the population dynamics of Donax trunculus Donacilla and cornea before, during and after the works** • **Monitoring the shoreline and submerged beach batimetriei after sanding** • **Monitoring the granulometric composition of sediments after sanding.**
Eforie-central area	Eforie - Central Zone	FI / ML (U)	***Alternative solutions:*** 1. Do not make any site works in or in its vicinity. 2. Identification of technical solutions that lead to natural accumulation of sand on the beach that borders the site.	• **Detailed scientific research on the dynamics population of Donacilla cornea, Ophelia bicornis and Donax trunculus for at least two years before beginning work** • **Based on research, identification of a period and methods for sanding artificial beach as possible to reproduce the natural phenomenon of sanding or accumulation of sediment in the area, both short term and long-term** • **Monitoring the population dynamics of Donax trunculus Donacilla and cornea before, during and after the works** • **Monitoring the shoreline and submerged beach batimetriei after sanding** • **Monitoring the granulometric composition of sediments after sanding.**
South Eforie	South Eforie	ML	Rehabilitation, improvement and construction of new protection structures with beach sanding	• **Annual monitoring by measurements of the line beach and the evolution of the submerged bathymetry of the beach** • **Monthly monitoring of bathing water quality;** • **Annual monitoring of the evolution of benthic fauna.**
Costinesti	Guidance from the lock wall to the south of Lake Villa Albatros (Costinesti South)	ML	Rehabilitation, improvement and construction of new protection structures with beach sanding Recommendations:	• **Mapping habitat distribution from 1170 to 1110** • **Monitoring the population dynamics of Pholas dactylus before, during and after the works**

			1. Do Not achieve any works that affect the natural rocky shore at Hotel Forum (northern limit of the site *ROSCI0281 Costinesti - 23 August)* 2. In the technical solutions adopted to identify solutions to mitigate the loss of sediment within the Natura 2000 site.	• **Monitoring of sediment migration in the northern area of the site Costinesti-23 August after sanding.** • **Annual monitoring by measurements of the line beach and the evolution of the submerged bathymetry of the beach** • **Monthly monitoring of bathing water quality;** • **Annual monitoring of the evolution of benthic fauna.**
Olympus - Venus	Olympus - From Maramures Hotel to Garofita	ML	Rehabilitation, improvement and construction of new protection structures with wider bays and beach sanding.	• **Annual monitoring by measurements of the line beach and the evolution of the submerged bathymetry of the beach** • **Monthly monitoring of bathing water quality;** • **Annual monitoring of the evolution of benthic fauna.**
	Neptune - Neptune jetty	ML	Reabiltation and improving of the existing structure	• **Annual monitoring by measurements of the line beach and the evolution of the submerged bathymetry of the beach** • **Monthly monitoring of bathing water quality;** • **Annual monitoring of the evolution of benthic fauna.**
	Jupiter - Venus - From Tismana Lake to Slivia Hotel	FI /ML(U)	Rehabilitation, improvement and construction of new protection structures with wider bays and beach sanding. 1. Do Not have made any works that affect the bay formed between the two rooms next epiuri Carmen, located inside the 0281 ROSC Cap Aurora site, likely to lead to limit free communication with the sea or clogging with sediment. 2. In this work area may be allowed only two epiuri recovery, provided that the	• **1170-8 with Cystoseira barbata habitat mapping of Carmen hotel right before work, measuring the density, coverage and biomass of this species, characterization of associated fauna biodiversity** • **Monitor all parameters listed above annually before, during and after work** • **Annual monitoring by measurements of the line beach and the evolution of the submerged bathymetry of the**

			works to be carried out only on the face from a wide epiurilor. 3. To reduce the negative impact of high turbidity waters, sanding or construction of dams to be done in good weather, calm sea, little wind (up to 2-3 Beaufort winds and high grade level 2-3 Douglas).	**beach** • **Monthly monitoring of bathing water quality;** • **Annual monitoring of the evolution of benthic fauna.** • **Monitoring of sediment migration in the shore area of the site Aurora Cape after sanding.**
Pond Mangalia	Pond Mangalia - Silvia Hotel - Cerna Hotel	ML	Sanding beach: 60m width, length will be determined in SF	• **Annual monitoring by measurements of the line beach and the evolution of the submerged bathymetry of the beach** • **Monthly monitoring of bathing water quality;** • **Annual monitoring of the evolution of benthic fauna.**
Saturn - Mangalia	Saturn - Froml Cerna Hotel to Diana Hotel	FI / ml (U)	Rehabilitation, improvement and construction of new protection structures with wider bays and beach sanding. **Alternative solutions:** 1. Do not carry out demolition of existing structures, construction of new structures for protection and sanding. 2. Will be limited rehabilitation works of existing structures. 3. It is a beach sanding job done only in the last two epiuri socket formed between the southern coast Mangalia, where you can accept a sanding 20m.	• **Monitoring the surface of the areas covered with Zostera noltii habitats 1110-1, 1170-8 and 1110-7 with Cystoseira barbata with Arenicola and Callianassa, their quality and representativity** • **Annual monitoring by measurements of the line beach and the evolution of the submerged bathymetry of the beach** • **Monthly monitoring of bathing water quality;** • **Annual monitoring of the evolution of benthic fauna habitats of interest to all site**
	Mangalia- from Diana hotel to the dam of North Mangalia	ML	Construction of new protection structures with wider bays and making a sanding of the beach, 20m in width	• **Monitoring the surface of the areas covered with Zostera noltii habitats 1110-1, 1170-8 and 1110-7 with Cystoseira barbata with Arenicola and Callianassa, their quality and representativity**

				• **Annual monitoring by measurements of the line beach and the evolution of the submerged bathymetry of the beach** • **Monthly monitoring of bathing water quality;** • **Annual monitoring of the evolution of benthic fauna habitats of interest to all site**
May 2	May 2	ML	Rehabilitation of existing structure base of cliffs and intermittent protection *Recommandations:* Hard Protection works to support the cliff and the road n which links the afferent fishing port and 2Mai and sanding to wide for beach restoration, a width of 60m.	• **Annual Monitoring by measurements of the line beach and the evolution of the bathymetry of the beach .** • **Monthly monitoring of bathing water quality;** • **Annual monitoring of the evolution of benthic fauna habitats titles of interest in the site**

CHAPTER 11 Non-Tehnical Summary

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Sediu Central Târgovişte: Str. I.H.Rădulescu, Nr. 3-5, Mun. Târgovişte, Jud. Dâmboviţa, România, 130010, Tel: +40 245 606 150, Fax: +40 245 210 852
Bucureşti: Str. Nicolae Caramfil, Nr. 87, et.3, sector 1, România, 14146, Tel: +40 31 437 01 24, Fax: +40 31 437 01 18
Constanţa: B-dul Tomis, Nr. 143 A, et. 8, Mun. Constanţa, Jud. Constanţa, România, 900591, Tel/Fax: +40 241 481 410

ANEXES:

A1 . Summary Assessment Strategy options in Northern Unit
Summary evaluation of strategic policies in Southern Unit
A2. Priorization of the intervention areas

Cell sedimentary	Sub-sector	Analysis of strategic options				Preferred policy option (U indicate the use of lightweight options)
		Without intervention (FI)	Withdrawals Controlled (RC)	Maintaining Line (ML) (U indicate light use alternatives, along with other defense systems, or solitary)	Advancing Line (AL)	
Delta Chila (Ukraine) till to the Sulina etelele	Musura Bay (state border with Ukraine until the Sulina Jetelele)	Strategic option was defined for the dry beach, seaward side of the dune / island that represents the border. BE is a continuation of the current approach because there defenses along this portion of the coast. The area is currently expanding, advancing in the lagoon. BE will avoid impact on birds in the Black Sea and the development will provide natural protection land and freshwater habitats (and species that inhabit them) in the Danube Delta Biosphere Reserve. No socio-economic goods exposed to significant risks, so even if this trend were to reverse, and the area would be subject to erosion and occasional flooding, there would be risks to the property.	It is an elongated area, which is growing. RC will avoid adverse effect on birds listed in the Black Sea and the development will provide natural protection land and freshwater habitats (and species that inhabit them) in the Danube Delta Biosphere Reserve. No socio-economic goods exposed to significant risks, therefore, build a line of defense is not deemed adequate, can be recognized unless some major benefits in terms of creating new habitats.	Currently, there is line of defense and future assets at risk of erosion and flooding, so this option is not taken into account.	This sub-option is not appropriate	**Without strategic intervention is the best option for this area because there are few socio-economic assets at risk, and one of the main features of the area is wildlife, undeveloped.** **Implementation option should be made taking into account the coastal strip as a whole, and decisions on future management of the Sulina Jetelelor and navigation channel maintenance.**
	Jellys of the the Sulina	Not applicable.	Not applicable.	The existing structures are port and navigation structures, not structures coastal protection. The structures will be preserved. Work on existing structures could have a negative impact on the integrity of Natura 2000 sites available.	Not applicable.	**FI** **It is assumed that in the future, port structures, structures that are not coastal defense, even if the influence of the processes will be preserved. Variants will be completed by further studies.**
Jetelele from Sulina to the southern tip of Sakhalin island	Sulina	It is a beach with sand dunes with a wide portion, which houses the freshwater wetlands, recognized worldwide. Southern end is a perisip.	The locations of depth, by building defense lines, the RC could be a solution, if in the future will increase the risk of flooding or	This can help prevent flooding and infiltration of salt water into freshwater wetlands of the Delta, but only through an aggressive approach,	It is not appropriate in this area	**ML** **Because the Sulina is a natural growth process and there are few socio-economic assets at risk, for the recommended**

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Bucureşti: Str. Nicolae Caramfil, Nr. 87, et.3, sector 1, România, 14146, Tel: +40 31 437 01 24, Fax: +40 31 437 01 18
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(Zatoane)		There are lines of defense of the coastal zone, except for one rocky embankment. However, this area is affected by jetelele from Sulina, which keeps this stable dynamics. For most coastal areas, FI is a continuation of current management practice. Currently, this sector is growing under the influence jetelelor from Sulina. There is a very low risk of erosion in terms of territory built and protected areas. There is a rocky embankment that will deteriorate over time, affecting probably local and coastal processes.	perisipului fractionation. The main benefit would be long-term protection of freshwater habitat and a flood of salt water infiltration. These lines of defense will be created along the open coast, so would not affect the sediment dynamics and would have limited visual impact.	that by rebuilding the beach. It is thought that might be favored as a natural process of constructing heavy defensive structures in this environment sensitive. Maintaining the line is a possible negative impact on the integrity of the Black Sea resorts. Rocky dam could be maintained or improved, but only use heavy protective structures would be inappropriate because it is an area that develops naturally.		**option without intervention.** **Implementation of this otiuni must be done taking into account the coastal strip as a whole, but also on management decisions in the future jetelelor in Sulina and navigation channel maintenance.**
	Channel probe	This sub-sector is characterized by a perisip protecting wetlands globally recognized. Dune system is very narrow or nonexistent. Now this is a sub-sector unprotected, therefore, would mean continuation BE actuale.Totusi management practice, there is a high risk because of this policy, perisipul to split, because the area is already subject to a high level of erosion. This would have a significant impact on freshwater ecosystems from land.	Because there is a high risk that perisipul to split, and the globally recognized wetlands to be flooded by building defense lines, the RC could be a solution. Besides protecting freshwater habitat / land of the realignment, could support opportunities to create habitat and saline transitions. Since these lines of defense will be open along the coast, they would have a negative impact on sediment dynamics and visual impact would be limited. It could impose road relocation Sulina - St. George. To slow the erosion, RC could include management techniques such as rebuilding or remodeling beach erosion.	This policy could prevent floods and saline infiltration in the Danube Delta wetlands globally recognized, but only through an aggressive approach, that the natural supply of beach material dredged off the outlet submerged beach. It can be considered that might be favored as a natural process of constructing heavy defensive structures in this environment sensitive. Keeping track is a possible negative impact on the integrity of the Black Sea resorts. Rocky dam could be maintained or improved with this option, but use only heavy defense structures would be inappropriate because it is an area that develops naturally.	Option is not appropriate for this area	**FI** **Depending on the future risks to the natural area with high ecological value, the recommended policy is controlled withdrawal. Policy implementation should be made taking into account the coastal strip as a whole, and decisions on future management of the Sulina jetelelor and navigation channel maintenance.**
	Casla Vadanei	This sub-sector is characterized by a	Because there is a high risk that	This policy could prevent flooding	Option is not appropriate for this	**RC (U)** **Depending on the future risks**

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Bucureşti: Str. Nicolae Caramfil, Nr. 87, et.3, sector 1, România, 14146, Tel: +40 31 437 01 24, Fax: +40 31 437 01 18
Constanţa: B-dul Tomis, Nr. 143 A, et. 8, Mun. Constanţa, Jud. Constanţa, România, 900591, Tel/Fax: +40 241 481 410

		beach that protects aquatic habitat areas designated internationally northern and southern coastal bar remains. Now this is a sub-sector unprotected, therefore, BE would mean continuing the current management practice. However, there is a high risk because of this policy, perisipul area north of this sub-sector to be split, because the area is already subject to a high level of erosion, which could lead to future sea level rise. This would have a significant adverse effect on freshwater ecosystems.	beach to split, and the internationally designated areas to be flooded, by building defense lines, the RC could be a solution along the coastal sections in depth. Besides protecting freshwater habitat near the shore, could support opportunities to create habitat transition. Since these lines of defense will not find the open coast, they would have a negative impact on sediment dynamics and visual impact would be limited. To slow the erosion, RC could include management techniques such as rebuilding or recycling of beach erosion.	and infiltration of saline wetlands in the Danube Delta in internationally recognized, but only through an aggressive approach, that by rebuilding the beach. It is thought that might be favored as a natural process of constructing heavy defensive structures in this environment sensitive. Maintaining the line is a possible negative impact on the integrity of the Black Sea resorts. Using heavy protective structures would be inappropriate because this is an area that grows naturally.	area	**to the natural area with high ecological value, indicated the withdrawal option is controlled by implementing aggressive measures to slow erosion protection and / or construction of a line of defense.** **Policy implementation should be made taking into account the coastal strip as a whole, and decisions on future management of the Sulina jetelelor and navigation channel maintenance.**
	St. Gheorghe	St. George area is characterized by a beach made up of a series of berme beach and depressions. There are sand dunes. Strategic option only covers the coastal area, not within the channel. In general, the natural stable, being protected, so a policy would be continued BE current management regime. City of St. George and the related assets are nearly a mile coastal strip, and, in case of destabilization of the area would be at risk of coastal erosion during the Plan.	Along this front, RC would be achieved by building a line of defense. However, the property is already protected by the coast, which is generally stable, so not a priority	ML option would be inadequate, consisting in the construction of hard-line defense, which would alter the natural features of the facades and would adversely affect Natura 2000 sites.	Option is not appropriate for this area	**FI / RC (U)** **Option no intervention is indicated for this place, which is currently stable and unprotected.** **Implementation option should be made taking into account the coastal strip as a whole.**
	Sakhalin	Sakhalin Island is a very dynamic piece that develops complex, cyclical. The island extends while rotating and	RC could be used to help preserve the integrity of the island, while it stretches and migrate through	Since the intention is to allow the island to continue to grow naturally, intervention options through ML is	Option is not appropriate for this area	**FI** **A policy without intervention is most appropriate for the mobile space to develop**

		moving by land through alluvial processes. Is unprotected and is a great ecological value. Option applies only to the coastal zone of the island, and BE would mean continuing the current situation. This would allow the continuation of natural cycles of growth and erosion of the island. Because erosion is part of the development and reflects the ecological interest of the site, do not believe that would have an adverse effect. The island houses the coast (see sub-sectors below).	retraining and redeployment mechanical / recycling sand along the coast. However, it is not considered appropriate in this place, because its natural function is an element of balance.	not appropriate for this place. Also, no economic assets at risk, and therefore this policy does not have any benefit. Ecological features very protected spot could be endangered as a result of the intervention.		**naturally and which presents an important ecological value.**
	Delta secondary tributary of St. Gheorghe-Ciotic	This sub-sector is characterized by coastal wetlands, showing fine sediment brought by the Danube. Protection against direct attack of waves is provided by Sakhalin Island. BE option is to continue the current regime. In this area there is a noticeable accumulation of sediments deposited activated due to flow of the Danube and the shelter offered by the island, so this policy would act with natural processes.	Since this area could accumulate and continue to do so, there is the potential benefits from implementing an RC policies.	There are economic assets at risk, and the naturally accumulate, therefore, this option is not appropriate.	Option is not suitable for this	**FI** **Without intervention is the best option for this system that works naturally and which accumulates due to silt and constant protection against waves of Sakhalin Island offered.**
	Ciotoic - Zatoane (southern coast of the back side the island of Sakhalin - and coastal wetlands system in Zatoane)	Here there are beaches narrow host internationally recognized wetlands. Currently, there is line of defense, therefore, BE would mean continuing the current situation. The area is in erosion due to lack of new sediment sand size, which could increase in future due to rising sea levels. Therefore, under this option,	Realignment option controlled by building defense lines would be costly and inappropriate in this system that works naturally, which is protected from strong winds and waves of Sakhalin Island. This area is currently unprotected and RC implementation has lead to the loss of its natural value. However, you may apply by implementing measures RC aggressive defense to	Construction of hard lines of defense that would alter the natural features of this area and would have an adverse effect on the integrity of Natura 2000 sites would be inappropriate. Intervention would not be consistent with the administration sites.	Option is not appropriate for this area	**FI** **Without intervention is most appropriate policies for the system that works naturally and is protected against adverse weather conditions Sakhalin Island.**

		the future could occur at high risk of erosion and flooding. There are economic assets at risk, but wetlands could be affected due to salt water infiltration.	slow erosion.			**FI**
Zatoane to Midia Port	Perisor	During this portion of coast beaches are backed by small dunes formations and coastal wetlands in the east Zatoane. The area is currently undergoing a process of erosion or have mild conditions generally stable. Perisor is currently unprotected area and there are several socio-economic goods. BE Optiuneade will mean continuing the current situation. By its application, it runs the risk of flooding and erosion, which in the north, could release sediment accumulated fossil coast that stretches from coast to land, but the south would result in flooding of salt water ecosystems important sweet Delta.	Over the portion of wetlands by constructing a line of defense, RC option would allow the facade to continue their natural development, reducing the risks caused by freshwater ecosystems due to infiltration of saline. Another line of defense could have a negative impact on the Danube Delta Reserve to mark the line of defense.	It would be inappropriate to build tough line of defense that would alter the natural features of the facades and would affect the transport of sediment downstream. Keeping the current line would be limited and how perisipul can respond to sea level rise. Could be taken into consideration version reconstruct the beach.	Option is not appropriate for this area	**A policy intervention is not indicated for the unprotected sector, with a high ecological value.** **Policy implementation should be made taking into account the coastal strip (from Zatoane to the Port of Midia) as a whole, because it is a continuous perisip.**
	Periteasca	Perisip is made up of beach, including Razim-Sinoe complex and is supplied with sand from the north, the alluvial deposits on the coast. This area is not protected, and the option would mean the continuation of this situation FI. However, in future, because this option may appear split perisipului risk, therefore the salt water intrusion into freshwater ecosystem Razelm Lake, which has a high level of	RC option would allow the extension of the coastline that develops naturally, providing a way to protect Lake Razelm. This could lead to the creation of a saline habitat and / or transition. However, creating a secondary line of defense would be costly and could have a negative impact on the character of the area and wild habitats in the Danube Delta Biosphere Reserve.	It would be inappropriate to build tough line of defense that would alter the natural features of the facades, and would affect the transport of sediment downstream. Keeping the current line would be limited and how perisipul can respond to sea level rise. Reconstruction of the beach could be a solution. However, the economic benefits would be insufficient, especially because we have considered the entire perisip, including sea transport regime.	Option is not appropriate for this area	**FI** **Without intervention option is most appropriate.** **Policy implementation should be made taking into account the coastal strip (from Zatoane to the Port of Midia) as a whole, because it is a continuous perisip. Full analysis is recommended for Lake Management Plan to assess risk Razim infiltration of salt water in the lake and any mitigation measures that would impose.**

		protection.				
	Portita	This is a natural front, except a short stretch of protected beach front Portitei mouth. It is characterized by a barrier beach that includes Razim-Sinoe lagoon complex. Besides Portitei mouth, FI would mean a continuation of current management practice. Portitei Gura, existing dams should be maintained, although it is estimated that it will take at least 10 years. As the defense breaks down and becomes less effective, currently owned beach Portitei mouth will be lost, which will have an impact on the resort. Barrier shoreline is eroding and migrate to the shore by over-washing processes. This could increase in future due to rising sea levels. There is therefore a high risk of formation of cracks, which could have an impact on the ecology of the lake ecosystem Razelm very protected.	RC A policy could involve improvement works ridge integrity while leaving it to migrate to the shore in response to rising sea levels. This could involve reshaping and redistribution / recycling mechanical barrier sand front to back. Although this could manage the risks to Lake Razim, would also have a significant impact on barrier beach morphology and habitat. It would also have an impact on the character of the area untouched. Under this option would not be intended that the existing structures to remain Portitei mouth.	Scale sub-sector, ML option, which uses heavy structures would not be right along the front, because fixing shoreline position would limit how the barrier is able to respond to sea level rise would impact on Special Protection Areas of the Black Sea (SAP) and would also have both a visual and environmental impact on the barrier. At the local scale, ML option would be appropriate to Portitei mouth, this would involve maintenance of existing dams to maintain a tourist beach here. Monitoring should be recommended to ensure that there is no erosion of stream upstream / downstream that could affect the integrity of the barrier beach. For the entire sub-sector may be considered beach recharge;	Option is not appropriate for this area	**BE** **Controlled withdrawal options for management measures to protect the integrity of the barrier light as it migrates towards the shore is considered the best.** **Policy implementation should be made taking into account the coastal cell (from Zatoane to the Port of Midia) in general, because it is a continuous barrier beach system.**
	Periboina	This sub-sector is characterized by a barrier beach complex comprising Razim-Sinoe lagoon. This is a natural front, except for a short selection of defense along the dam Periboina the mouth, but he is willing to back the coast at the entrance to the lake. Therefore BE would be a continuation of the current situation. Front currently undergoing an erosion rate, the migration barrier to shore by	RC A policy could involve improvement works ridge integrity while leaving it to migrate to the shore in response to rising sea levels. This could involve reshaping and redistribution / recycling mechanical barrier sand front to back. Although this could manage the risks to Lake Razim, would also have a significant impact on barrier beach morphology and habitat. It would also have an impact on the character of the area untouched.	A policy of ML, which uses heavy structures would not be right along the front, because fixing shoreline position would limit how the barrier is able to respond to sea level rise would impact on the Special Protection Areas Black Sea (SAP) and would also have both a visual and environmental impact on the entire sub-sector barierei.Pentru could be considered artificial beach sanding, but not enough economic benefits, especially since the entire barrier system should be taken into account.	Option is not appropriate for this area	**FI / RC (U)** **Without intervention or withdrawal option controlled light management measures to protect the integrity barrier as it migrates towards the shore is considered the best.** **Implementation option should be made taking into account the coastal cell (from Zatoane to Midia port) in general, because it is a continuous barrier beach system. We recommend a complete analysis of the Lake Management Plan**

		over-washing processes. This could increase in future due to rising sea levels. There is therefore a high risk of formation of cracks, which could have an impact on the ecology of the lake ecosystem Razelm very protected and the Danube Delta Biosphere Reserve.				**to assess the risk incursion Razim salinity in the lake and any measures to reduce these effects could be necessary.**
	Chituc	This is a natural front mainly characterized by beaches composed of a series of barriers relicta beach. There is a short structure at the mouth of the dam Edighiol. BE would mean a continuation of the current situation for much of the coast. Now the coast is generally stable and face only a small erosion that will result in restoration of relict beach deposits, with subsequent transport to the south. Currently there are few socio-economic assets at risk, although there are plans approved for a new urban development. There is also a sanctuary for birds and a protected habitat in the Danube Delta Biosphere Reserve potentially at risk of erosion and flooding.	RC can be considered as an option in order to create habitat, and would involve a withdrawal rather than a defense of shoreline.	If development progresses on the Urban Area Plan approved unuji area is at risk. Defense defense with large structures along the coast running back would affect the natural character of the front, while an option such as a light sanding would allow artificial beach area continue to evolve naturally while providing protection against flooding and erosion. An artificial beach sanding scheme, but would probably require some control structures, sediment would otherwise be lost to the south. Impact on other areas of the neighboring cells must also be considered.	Option is not appropriate for this area	**FI / RC** **Currently, a policy intervention is not the best in this location with natural evolution of environmental interest.** **Policy implementation should be made taking into account the coastal cell (from Zatoane to the Port of Midia) in general, because it is a continuous barrier beach system.** **Urban Area Development Plan as proposed to be analyzed and developers must be aware of the risks of erosion.**
	Corbu (Midia Cape)	This sub-sector consists of beach pocket at the cliffs. Although there is no defense along this strip, the area is significantly affected by the quay in the port of Midia. BE A policy requires that these structures remain, and that therefore the current situation to continue. There are a number of socio-economic assets in the front Corbu including population, trade and tourism, and limestone deposits. But now the front increases and therefore	RC option would involve the use of defense systems to slow erosion, but this is not appropriate here because it does not provide sediment for beach cliffs and are not designated for their geological exposures. A consolidation would also have impact on the integrity of Natura 2000 sites.	Because the coast is now a channel for sediment, it would be inappropriate to build defense systems and to modify the character of the natural functioning of the front. If for any reason, construction of the cliff at risk in the future, could be considered various options, such as artificial beach sanding or consolidation.	Option is not appropriate for this area	**FI** **As this front is currently growing naturally, and no defense systems, a policy intervention is not appropriate.**

		there is a reduced risk of erosion. Coast here is expected to remain stable or channel sediments remain as long as the dams. BE is likely to be beneficial for Natura 2000 sites in this area.				
	Midia Port	Not applicable.	Not applicable.	Port structures are structures rather than structures and navigation of coast defense and therefore not considered in this report. It means simply that they will remain and therefore in the context of this report, the policy will apply a ML. The works associated with this option have the potential to significantly affect Natura 2000 sites and may require additional consideration in terms of EC Directives on habitat and birds.	Line option would allow advancement of drainage area or larger spaces for navigation as part of port operations. Dams already extend beyond the active profile of the beach so that small changes would not be expected to have a significant impact coasta.Insa processes, significant advances could have a negative impact on sediment cells from north or south. Advancing the line would also have potential adverse impacts on Natura 2000 sites	**FI** **It is assumed that port structures, which are not coastal defense structures even influence processes coast will be maintained.** **ML**

Summary evaluation of strategic policy in Southern Unit

The cell sediment	Sub-sector	Analysis of options				Preferred policy (U indicate the use of lightweight options)
		Without intervention (FI)	Withdrawals Controlled (RC)	Maintaining Line (ML) (U indicate the use of lighter options, along with other defense systems, or solitary)	Advancing Line (AL)	
Gulf Mamaia – Midia Cape till Constanta Port	North Navodari	This sub-sector is characterized by a barrier beach in front of Lake Siutghiol. Front is generally stable due to the protective key southern port of Midia, and there is an accumulation of sediments immediately south of the structure. But it is vulnerable to storms south-eastern. FI is a continuation of existing management approach because there defense systems. Beach currently provides natural protection for socio-economic assets Navodari. But if the front starts to erode, there is significant urban assets at risk.	A policy would not be appropriate because RC building a defense line back would result in loss of assets of the city Navodari.	Because the shoreline is currently stable, there is no justification for providing defense systems. But if the front starts to erode, you may need a means of protecting the city Navodari. ML option, using the structures of the country would not be appropriate for North Navodari because it would alter the natural functioning of barrier beach, and would limit how it can respond to sea level rise. But sanding or shaping artificial beach would allow strategic management and urban economic assets which would otherwise be in danger. This would be an expensive option and should be strategically applied to the entire length of the bay that success. If this option is submitted, would require a further appreciation of its application on the Black Sea SAP.	Option is not appropriate for this area	**Since this area is currently stable without intervention option is best suited for North Navodari subsector.** **FI**
	South Navodari	There is a barrier beach that protects Siutghiol large lake. Top barrier is built, residential and tourist facilities and local infrastructure. Beach is currently undergoing a low erosion. A policy would mean a continuation of FI management practice because the front is not current device. But ongoing erosion would increase the risk of erosion and flooding on the rear barrier construction, and flood salt lake Siutghiol SAP (Natura 2000 site).	RC in this sub-sector would mean building a back line of defense to protect assets and built environment at risk. But there is little opportunity for this, because it would result in the loss of a number of these assets, and therefore this policy is not considered appropriate.	Although shoreline erosion face, the rate is currently low. But if it will increase the risk would appear to properties and infrastructure built on barrier beach and the lake Siutghiol protected. ML option, by building strong defense systems would be inappropriate because it would limit the operation of natural barrier beach. Intervention options using a light sanding and artificial beach would allow risk management to shore back, while allowing natural processes to continue.	Option is not appropriate for this area	**Because erosion rates are currently low, and there are limited social and economic assets at risk, the best policy for the front really is no intervention.**

				However, this option should be applied as part of a strategy for the entire barrier beach for it to succeed. In addition, consideration should be given an option of keeping the impact on the integrity of Natura 2000 line (SAP and SAP Siutghiol Lake Black Sea).		**FI**
	North Mamaia	North is at the center front Mamaia beach in front of Lake Siutghiol barrier. Sediment transport is to the north, and there is a lack of fresh sediments as a result of defense systems in central and southern Mamaia. Therefore front face mild erosion. The land between the beach and the lake is developed, Mamaia is a major tourist resort. A policy is a continuation of the FI current management policy because the front is now necessarily. But there are significant tourism activities would be at risk of flooding and erosion, including a number of properties that are built out on the beach, the sea to the natural line of the beach. If there is a break in the barrier beach, or if long-term erosion rate increases significantly, there is risk of salt water incursion in the SAP ecosystem freshwater lake Siutghiol	In this sub-sector option would involve construction of a RC line of defense back. But there are significant tourist activities located along the shore back, which would be lost thereby. Thus, this option would be expensive to build, and lead to a loss of benefits would not be economically justifiable, and therefore is not considered appropriate.	This front is currently subject to erosion, and are at risk properties immediately behind the beach. ML option would allow defense systems to be built to protect these assets against flooding and coastal erosion, and minimize risk of damage to Lake Siutghiol SAP. But defense systems should be implemented in a strategic manner, taking into account the total length of the beach and therefore lighter options such as artificial beach sanding would be more appropriate than the construction of heavy defense systems. Heavy defense systems can lead to problems in downstream areas of the beach, have the potential to impact on the Black Sea SAP (a Natura 2000 site) and could affect the attractiveness and aesthetic value of this important tourist areas.	Option is not appropriate for this area	**The best policy for this front is ML to allow protection of socio-economic assets against flooding and erosion. This policy would reduce long-term risk of salt water incursion in Lake Siutghiol SAP but has the potential to affect the integrity of the Black Sea SAP. This policy should be implemented giving due weight to natural processes of the entire beach, so the easy option is preferred.**
	Mamaia center	Mamaia center is characterized by a barrier beach, bordered by tourist buildings, and the presence of two sites designated under Natura 2000, SAP and SAP Siutghiol Lake Black Sea. There are several dams in general, but they are strongly degraded. BE would mean that these	Mamaia Center RC option would mean building a line of defense in the back to provide protection for significant assets (built and natural) risk. But this is not economically justified because of the number of properties located immediately inside the beach, who would lose.	Since this area is currently protected, a policy could mean that ML defense systems available to be rehabilitated. But because they are ineffective, it is likely that new defense systems to be built to protect against erosion. Heavy defense systems should be considered strategic given the total length of the beach and	Option is not appropriate for this area	**ML (U)** **Considering the number of assets at risk, ML is the best option. This will not affect ROSPA00T6 Black Sea and would allow the continued protection of designated freshwater habitats ROSPA0057 Siutghiol lake.**

www.blomasa.com office@blominfo.ro

Sediu Central Târgovişte: Str. I.H.Rădulescu, Nr. 3-5, Mun. Târgovişte, Jud. Dâmbovița, România, 130010, Tel: +40 245 606 150, Fax: +40 245 210 852
Bucureşti: Str. Nicolae Caramfil, Nr. 87, et.3, sector 1, România, 14146, Tel: +40 31 437 01 24, Fax: +40 31 437 01 18
Constanţa: B-dul Tomis, Nr. 143 A, et. 8, Mun. Constanţa, Jud. Constanţa, România, 900591, Tel/Fax: +40 241 481 410

		structures would be maintained. They are ineffective and the area is currently subject to erosion. Once these systems gives protection (which is what is expected in about five years), a period of accelerated erosion is expected, increasing the risk of socio-economic assets tourist resort and possible long-term freshwater habitats of SAP Lake Siutghiol.	Therefore this option is not considered suitable for the front.	the potential impact on vulnerable sub-sectors to the north. Numerous socio-economic assets that are currently built on the seaward boundary of natural beach would be lost if defense systems would be built on this limit. Heavy defense systems can also affect the integrity of the Black Sea SAP and attractiveness value and aesthetics of the beach in this important tourist resort. Therefore easy options, such as artificial beach sanding is recommended, possibly in combination with large dams. Large dams have the advantage of ensuring a stable environment for shellfish growth, a source of sediment to the beach.		**This option should be implemented with as much consideration for the natural processes of the entire barrier beaches, with additional development on the beach.**
	South Mamaia	The beach is artificially maintained by a series of offshore breakwaters and various structures connected to the shore, but are narrow and eroding beaches. The beach is backed by Mamaia resort. A BE ptiunea not appropriate because it would mean that existing offshore breakwaters would be maintained. They are currently inefficient and in poor condition and is expected to yield less than 5 years. Front is already eroding. Mamaia is one of the main resorts of Romania and there are significant socio-economic assets at risk including hotels and restaurants and associated facilities. FI has the potential to significantly affect the integrity of the Natura 2000 site but can benefit Siutghiol Lake Black Sea SAP. It is not considered appropriate to allow	RC implementation option would mean that at Mamaia Sud existing defense systems would be maintained and a back line of defense should be built. This would allow most asset protection and socio-economic environment, but could result in accelerated erosion of the beach, which is the main economic value of the resort. The construction of such a back line of defense would result in loss of some of the main socio-economic assets which are located immediately to the beach shore, and therefore this policy, which would also be expensive, would not be economically justified.	Current defense systems are in poor condition and is expected to yield in about 5 years. ML option could mean that existing defense systems are upgraded. But because they are inefficient, it is likely that new defense systems to be built to resort to sanding artificial beach to provide protection against coastal erosion. Construction of heavy defense systems should be considered strategic given the total length of the beach barrier, because any defense systems built here could affect northern barrier sediments. Maintaining the line also has the potential to significantly affect the integrity of the Black Sea SAP (a Natura 2000 site). Since the beach is a valuable socioeconomic stations, easy options for creating and retaining the beach is recommended, possibly in combination with heavy defense systems. Large dams have the advantage of providing a stable environment for shellfish growth, a source of sediment to the beach.	Option is not appropriate for this area	**ML (U)** **Considering the density of population and assets in the area, ML is the best option for South Mamaia. This will not affect the Black Sea and SAP therefore recommended options for creating and sustaining a soft beaches.** **This option should be implemented with as much consideration for the natural processes of the entire barrier beaches, such as the preferred option is soft.** **A further development of properties (eg. Restaurants, bars, shops, etc..) Active beach should be avoided because of the high risk area is subject to erosion and over-wash during storms.**

		natural processes to continue along this front and artificially maintained significant economic loss due to socio-economic potential of assets.				ML (U)
	Tomis Nord	Tomis Nord area is characterized by narrow beaches bordering cliffs, artificially maintained through a series of structures, including dams and epiuri. North Tomis Constanta belongs, here there are many socio-economic assets. In some sections of the cliff was stored in the gravel and ballast from demolition, in an unsuccessful attempt to stabilize cliffs and slowing erosion. Currently, the area is in the process of erosion, and existing protections are generally in a poor condition. BE A policy would mean that these structures will be maintained. Is expected to yield in less than five years and thereafter is expected to follow a period of accelerated erosion. This would not be indicated in the sub-sector in question, because the assets at risk from erosion, the assets includes commercial, residential and industrial buildings and related infrastructure. BE will probably benefit the Black Sea SAP Natura 2000, unless there is a risk of pollution from demolition waste from the pit in front cliffs ecological.	A policy to Tomis Nord RC would be appropriate here, because that would be implemented as a line of defense more withdrawn, probably as a consolidation of the cliff base. This would only slow the erosion of the cliff, rather than prevent, and lead to loss of important socio-economic assets.	Tomis Nord exitente protections are currently in a state ranging from acceptable to very damaged and is expected to give the maximum of 5 years. A ML policy could mean a rehabilitation of existing structures or building new ones or some artificial beaches. In this area, some protections are in a better state than others, therefore, would be most likely a combination of measures to maintain and improve, to provide continuous protection against erosion. This would make possible the protection of important socio-economic assets in the area, including tourist facilities. However, keeping the line could affect the integrity of the Black Sea SAP (a Natura 2000 site). It is therefore recommend a combination of easy options, such as beach stabilization maintained by dams or other constructions. This would provide a more durable protection than heavy structures that cause reflection waves and shoreline erosion, and would help maintain or improve the value and attractive tourist area.	Option is not appropriate for this area	**ML (U)** **Option of maintaining the line would be recommended to Tomis Nord significant assets at risk where there is coastal erosion. A policy that combines heavy defense systems easy option is recommended for both flood protection from extreme storms, and against erosion and maintain the value of attractiveness of the area. Consider the impact on Natura 2000 sites will be required under the EU Birds and Habitats Directives. Large dams and beach stabilization structures has the advantage of creating a stable environment for shellfish growth, a source of sediment to the beach can also help improve water quality.**
	South Tomi	South Tomi consists of artificially maintained beaches with a variety of heavy protection, including large dams burst-wave. The beach is bordered by cliffs, which, sometimes,	A policy would not be appropriate to RC South Tomi, because it involves construction of a new line of defense, probably as a consolidation of the cliff base. This	Existing defense systems are currently in poor to good condition and is expected to yield in 10 years. A ML policy could mean that existing defense systems are rehabilitated or built new defense	Option is not appropriate for this area	**ML (U)** **A policy of maintaining the line is considered the best in South Tomi socioeconomic assets where there is significant risk of flooding or**

		gravel and ballast from demolition stored at the base, in an unsuccessful attempt to stabilize and urban development as part of the city of Constanta. Constanta is the main tourist beach area located in the front. Today, the beach is stable. This front is affected by the docks of Constanta Port, near the south, which is expected to be maintained. Existing protections are not maintained in the BE policy. Given that their current state varies between acceptable and very degraded, is expected to yield in more than 10 years. Although the shoreline is currently stable, this is due to artificial nature of the front and, after disposal of protections, is expected to produce rapid erosion. This is not a desirable option in many socio-economic assets were in danger from flooding the coast and especially erosion. These assets include commercial, residential and industrial buildings and related infrastructure. BE will probably benefit the Black Sea SAP Natura 2000, but could at the same time to jeopardize due to pollution resulting from waste materials from the pit in front of the cliffs.	would act as a measure to slow the erosion, but would not reduce the risk of erosion for a significant number of socio-economic assets located on the cliff.	systems and artificial beaches. On this front, some of the defense systems are in a better state than others, and therefore a combination of maintenance and improvement is likely to give protection against erosion shore current. However, maintaining the integrity of the line could affect SAP Black Sea (a Natura 2000 site). Consequently, the front port located north of Tomis, would recommend a combination of easy options, such as artificial sanding with dams and beach stabilization or epiuri to Tomis Port northern front. This would ensure a more durable protection than heavy defense systems that cause erosion and shoreline reflection valurolor. This would not be appropriate between Tomis and Constanta ports where modernization and reconstruction of existing defense systems would be recommended.		**erosion subject to the coast.**
	Constanta Port	Not applicable.	Not applicable.	Structures are structures rather than the port and navigation structures to defend the coast and therefore are not considered in this report. It means simply that they will remain and, therefore, the purpose of this report, the policy will apply a ML. It may be necessary to take into account the Birds Directive regarding the impact of this option works in Special Bird Protection Area (SAP)	A promotion policy would allow land claim or the existence of large areas for sailing, as part of port operations. Port dams already extend beyond the active profile of the beach, so presumably some small changes will have a significant impact on coastal processes. However, a significant advancement could	**ML (U)** **It is assumed that port structures are not structured to defend the coast, even influencing coastal processes will be preserved.**

				Black Sea.	have negative impact on sediment cells north and south, and works to advance the line could have a negative effect on Special Protection Areas (SPA) Black Sea (Natura 2000).	
Eforie - Cape Tuzla	North Eforie	Eforie Nord is a front with small coves made of artificial cliffs narrow coastal separate structures. At the south end, the front is made from a natural platform with little sediment. The exception is near the new marina, where there is a relatively wide range and healthy. The interior is developed and Eforie is an important tourist resort. This front is affected by dams Constanta Port to the north, which is expected to be preserved. Various existing coastal structures could be destroyed if they adopt a policy BE. Most defenses are in poor condition and are expected to fail within 10 years (except tourist port). After this, there may be a rapid erosion and eroded cliffs system would return to natural with little or no beach. BE will avoid impact on Special Protection Area Bird Black Sea, but there is the possibility that erode FI (leading to compression of the coast) dunes of the tourist port and main characteristics of the SCI dunes from Agigea (Natura 2000).	To the front of cliffs, RC would mean that existing structures be allowed to deteriorate and at the coast will be taken to slow the erosion, and their consolidation. This would be expensive and would not be economically justified because of the importance of property built on cliffs and socio-economic importance of the beach. Therefore, this policy would not be appropriate for North Eforie.	North Eforie existing defenses are generally in poor condition and most of previously withheld beach was lost. A policy would allow defense ML be rebuilt or replaced and be innisipate artificial beaches to create a more sustainable system. This would help reduce erosion risk management and the cliffs. Depending on the nature of the structures in place, there could be a positive impact on the aesthetic value and attraction of the beach. Line maintenance but may affect the integrity of Natura 2000 sites.	Option is not appropriate for this area	**ML** **Option be or ML (U) by identifying technical solutions that lead to natural accumulation of sand in the area without doing sanding, are alternatives to avoid significant impact on rocky habitats in the area between the fishermen and hotel Agigea Eforie Great Star North.** **Maintaining the line is the best option for North Eforie of Hotel starfish.** **We recommend an approach based on artificial beach sanding and structure of protection with large dams. Large dams and beach stabilization structures have the advantage of providing a stable environment for growth of molluscs and crustaceans, a source of beach sediment that can improve water quality. But it is possible to affect ML Bird Special Protection Area Black Sea and further study is needed on this Natura 2000 site in view of the EU Birds Directive.**

	Eforie Center	This front is characterized by a barrier beach that separates the area of Special Protection Areas (SAP) Techirghiol the Black Sea. The rear of the barrier beach is developed with a double road, rail and coastal socio-economic goods associated tourist resort. Currently, the front is eroding, with the northern section of the beach south relatively healthy and narrow. In this area and its nearby beach is submerged Eforie ROSCI0197 Suds ROSCI0273 Eforie North Marina area from Cape Tuzla, A policy would mean that Fi will not initiate any management intervention erosion present at Eforie Center and the existing structures can give. At the end of the beach from the south to build a protective wall, which is supposed to last for 15-20 years. But submerged dams can fail in less than five years. On the other hand, FI option would avoid the impact on Special Protection Areas (SAP) and Black Sea habitats from North Beach in Eforie submersible (SCI), Site of Community Importance (Natura 2000). .	A CR policy would mean developing a line of defense removed. Although this would allow protection of Lake Techirghiol, in terms of environment, it is inappropriate for the highly developed barrier beach and major transport links. Changing coastal processes due to the RC could significantly affect the sandbanks and the beach bars malo submerged sediments from North Eforie (SCI) at the marina Eforie South Bird Special Protection Area and the Black Sea - this would require consideration more from the perspective of EC Directives Habitats and Birds.	A policy to Eforie Center ML would allow socio-economic goods to be protected from flood and erosion risk. This could be implemented by maintaining and upgrading existing structures, which are expected to yield within 5 years (except new structures in the south). It could also mean the construction of new protections, in combination with artificial beach sanding to keep the attraction value of the front. But it would require extra attention on protecting the submerged beach at North Eforie Eforie South (SCI) .. Depending on the mode of implementation, this option should be to consider local protection or move buildings, where they were located on the seaward boundary of natural beaches, buildings that would otherwise be at risk of erosion in particular. ML option could be implemented using technical solutions leading to natural accumulation of sand on the beach that borders the site. Develop an appropriate solution would require a close collaboration with the environmental authorities to manage the risk faced by the locations in question.	Option is not appropriate for this area	**FI / ml (U)** **Alternative options for the front center Eforie as FI / ml, recommend an approach based on natural accumulation of sand. Additional attention as necessary to mitigate the effects on submerged beach from North to South Eforie (SCI).**
	South Eforie	The South Eforie, there are a number of artificial bays protected by a series of defense items, which include structures like dams modified and artificial headlands. The beaches are	RC option is to build defense elements are slowly eroding cliffs at the base, while allowing existing defense items to give.	The South Eforie, ML policy would allow rebuilding or replacing existing inefficient defense elements and sanding artificial beaches, in order to reduce the risk of erosion of shoreline areas of	Option is not appropriate for this area	**FI / ml (U)** **Maintaining the line is the best policy for Eforie South, where there are many socio-economic assets at risk of coastal erosion**

		narrow and erosion in the face of cliffs, whose crownings part of Eforie resort. Cliffs present a risk of landslides. Existing protective elements are in poor condition and largely ineffective, with a residual life expectancy of less than 5 years after that period would give an option for track FI. This would lead to rapid loss of existing narrow beaches, increasing the risk of erosion on cliffs necessarily. This policy would be inappropriate because it is likely to lead to loss of socio-economic assets, including property and infrastructure. Because the cliffs are fine sediments, sediment eroded material is not suitable for the beach. In this area and its nearby beach is submerged Eforie ROSCI0197 Suds ROSCI0273 Eforie North Marina area from Cape Tuzla,		socio-economic goods. Depending on the nature of the structures in place, there could be a positive impact on the aesthetic value and attraction of the beach. keeping the line does not affect Natura 2000 sites.		**ML (U)**
	North Tuzla	North Tuzla is characterized by cliffs that are eroding and are subject to landslides in the vicinity of narrow beaches under erosion. Front is not the device, except for new works to protect the cliffs to the north sub-sector. Thus, the option would be a continuation BE current management practice, except for short front device, to which defense elements are not considered to be effective in the long run. Front would continue to erode and is likely to increase erosion rates in the future, but there is little real risk. Sediments that erode from the	RC North in Tuzla option could mean implementing measures to slow the erosion to the cliffs. This could be similar to recent work to protect the cliffs. But opting for a policy could be wrong RC now, because of costs and lack of property at risk.	North at Tuzla, an ML option would mean building solid defense items to protect or improve the drainage base cliffs. It also may involve lighter options such as artificial sanding to reduce the risk of erosion on the cliffs by reducing wave action based. Because this is a cape, protective structures would be needed to preserve its substantial beach. ML is not appropriate because it would be very expensive and because there is little real risk. Maintaining the line could affect the integrity of Bird Special Protection Area (SAP) Black Sea.	Option is not appropriate for this area	**The best option for North Tuzla, where the cliffs to erode naturally and there is little real risk, is the policy of no intervention.** **We recommend setting up a buffer zone width, to restrict future developments that could occur in the area at risk of erosion.**

		cliffs are worn mostly offshore, outside the active beach system.				**FI**
Cape Tuzla - Mangalia	South Tuzla	Here there are unstable cliffs, narrow beaches near being eroded. Cliffs are subject to landslides, but there is little real risk of erosion. Front is not the device, except for new works to protect the cliffs to the north sub-sector. However, it is assumed that they are not effective in the longer term. Within an option FI, current management regime could be continued. Permanent and natural erosion will continue and as new works will become less effective, erosion rates will increase. But the interior is undeveloped and is used in agriculture, so there are few socio-economic assets at risk.	RC option to Tuzla South could mean implementing measures to slow the erosion to the cliffs. This could be similar to recent work to protect the cliffs. But opting for RC option could be wrong now, because of cost and lack of assets at risk. RC would be an expensive option and wrong.	At Tuzla South, a policy would mean ML defense build heavy elements to protect or improve the drainage base cliffs. It also may involve lighter options such as artificial sanding to reduce the risk of erosion on the cliffs by reducing wave action based. This would reduce the risk to agricultural land, but would be expensive and limited economic benefits, so it is not justifiable. Maintaining the line could affect the integrity of Bird Special Protection Area (SAP) Black Sea (a Natura 2000 site).	Option is not appropriate for this area	**The best option for South Tuzla, where the cliffs to erode naturally and there is little real risk, is no policy intervention.** **We recommend setting up a buffer zone width, to restrict future developments that could occur in the area at risk of erosion.**
	Costinesti	Costinesti consists of a beach erosion under generally defenseless, supported by small cliffs of which includes Lake Costinesti Costinesti. There are new elements of defense that protects the entrance / exit of the lake. BE option would allow continuation of natural processes, without carrying out work on flood management and erosion risk faced by socio-economic goods, some of which are built to the sea, to the limit range. It is assumed that existing defense items anymore about five years, although the defense structures of the lake are expected to	The Costinesti, RC option would mean that existing structures be allowed Defence to give, and implement measures to slow the erosion at the base of cliffs. But, although this would allow natural processes to be continued in part would be inappropriate because of the increased risks that would be subject to socio-economic goods.	ML option to Costinesti would mean keeping the existing defense items or build new items. However, because the front is currently under erosion, limited existing structures would not be sufficient to manage risk to erosion. Depending on how you evoula northern beach in the coming years, following the construction of new dams, it may be necessary in the future artificial sanding. ML would allow erosion risk management for socio-economic goods and increased salinity risk management	Option is not appropriate for this area	**FI** **Maintaining line option is the most suitable area.**

		last more than 15 years. Front is currently under erosion and erosion rates are supposed to increase the loss of defensive structures. This option is not suitable because of the risk faced by many socio-economic goods.		or flood risk for Costinesti Lake. Maintaining the line could affect the integrity ROSCI0281 Costinesti - 23 August. Therefore, it is recommended not to perform any work that affects natural rocky shore, and the technical solutions adopted to identify solutions to mitigate the loss of sediment within the Natura 2000 site.		**ML (U)**
	23 August	The area consists of 23 August near unstable cliffs and small beaches being narrow erosion, and is generally no defense, although in the north are currently running consolidation of cliffs. This represents only a small part of the area. For this reason, the current regime is a continuation option BE administration. Supersede natural processes and natural shoreline will evolve. Would have stopped any construction works for defense and existing items will be allowed to deteriorate. Near the shoreline is natural and is used as agricultural land, so there are few socio-economic goods at risk.	RC option on 23 August would mean implementing measures to slow the erosion to the cliffs. However, this option would be inappropriate because of high costs and limited number of goods subject to the risk of erosion.	ML option on 23 August would mean building heavy defense items to protect the cliffs base and reduce the risk of flooding and erosion, or sanding artificial beach to reduce erosion risk by reducing base attack waves on cliffs. Although this would reduce the risk to the shore area, the policy is not appropriate because there are few socio-economic assets at risk. Maintaining the line could affect the integrity of Bird Special Protection Area (SAP) Black Sea (a Natura 2000 site).	Option is not appropriate for this area	**The best option for 23 August, where the cliffs to erode naturally and there is little real risk, is the policy of no intervention.** **We recommend setting up a buffer zone width, to restrict future developments that could occur in the area at risk of erosion.**
	Olympus - Venus	Olympus-Venus area is characterized by a succession of beaches with tourist resorts. Wholeness front is maintained artificially by a series of coastal structures including epiuri, artificial headlands and offshore breakwaters. The area is currently undergoing erosion.	Olympus RC-Venus option would mean accepting the loss of existing protective elements and construction of a new defense lines withdrawn. Available space is too limited to allow the creation of a sustainable natural beaches and there are many socio-economic	Since the elements of defense along the front Olimp-Venus are in poor condition, a policy would involve ML substantial work to improve risk management structures and erosion protection. There is currently shore erosion and existing defense structures pose a threat to health and safety because of the quality is poor	Option is not appropriate for this area	**FI** **ML option is recommended, in compliance with all conditions imposed by this ROSCI0281 Cap Aurora in the area.**

		BE option would mean allowing these structures to deteriorate and yield. Because they are generally in poor condition, are expected to yield about 5 years, then increase the speed of erosion. As this front is characterized by numerous tourist resorts, and because there are socio-economic assets at risk of erosion, FI would not be a proper policy.	goods that could be lost due to such policies. Therefore, ML is not considered suitable.	water and sheltered areas of the structure. Renewal defense elements with better placement of large dams and wider and more open beaches would be a costly option, but would mean reducing erosion risk faced by significant socio-economic goods, and at the same time, improving major beaches. Maintaining the line could affect the integrity ROSPA0076, ROSCI0281 Cap Aurora, ROSI0293Costinesti-23 August, sulphurous springs ROSCI0094 submarines from Mangalia Therefore, we recommend combining a light options, such as maintaining beaches, with dams or spurs for the beach.		**ML (S)**
	Pond Mangalia	Mangalia Pond is characterized by a barrier beach that separates the great from designated wetlands in terms of environment. The area is protected and is now being eroded. BE would allow the beaches to function naturally. However, the risks in terms of the environment to which is subject to the Natura 2000 SCI Marsh Mangalia, would increase as the erosion continues. There is a risk of piercing the barrier beach, which could lead to the incursion of salinity in marshes and may affect the ecosystem and its environmental value. Also, there are many socio-economic assets built along the beach barrier, which are at risk from flooding and coastal erosion, including a coastal	Mangalia RC Pond option would mean building a defense line withdrawn to manage risk faced by wetlands, while allowing natural beach work. However, this policy would be expensive and would affect the natural character of the area and road closure or withdrawal.	Pond Front Mangalia is currently being defenseless and natural erosion. ML could be implemented to reduce the risk faced by designated areas in question and socio-economic assets built in the barrier beach beyond. Heavy defense structures would be inappropriate because it would alter the natural functional character of this war. An easier option, such as artificial beach sanding would allow continued natural evolution of the area, while providing protection from erosion. This would reduce the risks faced by the Natura 2000 site on land and coastal road.	Option is not appropriate for this area	**Because of low line coastal development, the best option to maintain Lina could be applied through the use of lightweight protective elements (sanding machines).**

		road.				**ML (U)**
	Saturn - Mangalia	Sub-sector Saturn - Mangalia is characterized by small cliffs behind the beaches of artificial dams located between structures and modified artificial headlands. There is a reef offshore. The area is near Mangalia, city and tourist resort. This sub-sector is influenced by structures at the southern port of Mangalia, which is expected to be preserved. BE option would mean that these elements of defense is not preserved and be allowed to surrender. Since the structures are generally in poor condition, this can happen in about 10 years. Front is currently subject to a significant erosion risk and without elements of defense, that risk would increase. In the area and its vicinity was ROSC 0094, and ROSCI0269.Aceasta ROSCI0114 policy is not appropriate due to numerous socio-economic assets at risk and health and safety hazards that exist because of defense structures damaged.	At Saturn - Mangalia, a CR policy would mean that existing structures be allowed defense is surrender, and implement measures to slow the erosion to the cliffs. This would be inappropriate because of the risks that would be subject to socio-economic goods from the shore.	Although there are many defensive structures in the Saturn - Mangalia, they are in poor condition and are expected to fail in about 10 years. A policy would allow rebuilding or replacement ML their general line of defense for keeping current. This would allow the risk to property management and resolve issues related to health and safety of existing structures. Defense structures should be reconfigured in some areas of large dams to create larger and longer, wider bays to improve circulation and water quality. ML has a significant impact on ROSCI0094.Drept therefore recommended rehabilitation works of existing structures in their current form. No sanding is allowed only in the socket of the last two southern coast epiuri Mangalia.	Option is not appropriate for this area	**There are many important assets at risk and is shore erosion. Therefore, the best policy for Saturn - Mangalia is the maintenance of the line. Implementation of ML option in complying with recommended alternatives.**
	Mangalia port	Not applicable.	Not applicable.	Structures are structures rather than the port and navigation structures to defend the coast and therefore are not considered in this report. It means simply that they will remain and, therefore, the purpose of this report will apply ML option.	Advancement option would allow the claim land line or the existence of large areas for sailing, as part of port operations. Port dams already extend beyond the active profile of the beach, so presumably some small changes will have a significant impact on coastal processes. However, a significant advancement could have negative impact on	**ML (U)** **It is assumed that port structures are not structured to defend the coast, even influencing coastal processes will be preserved.**

					sediment cells north and south.	**ML**
May 2 –CAPUL Schable(Bulgaria) - Vama Veche national border (state border with Bulgaria)	May 2	Here there is a rocky front, two small beaches. There are no defense, except for a single structure at the south end of the area, which is used by fishermen. The beach is eroding and cliffs are subject to landslides. Serves beach resort May 2. This front is influenced by structures in the port of Mangalia on the north, structures that are supposed to be maintained. BE option would mean continuing natural processes and further deterioration of existing structures. However, this policy is not considered suitable due to numerous socio-economic goods would be subject to increased risks of floods and erosion.	RC option would mean the implementation of measures to slow the erosion to the cliffs. Although this would protect significant socio-economic goods for the resort, there is still risk of erosion and, therefore, this policy is not economically justifiable.	May 2 Front is largely defenseless and is a major seaside resort. Such a policy would mean ML building new structures to manage coastal erosion protection and flood risk. New structures would be inappropriate heavy defense because it would significantly alter the character of the area would result in loss of important beaches and could adversely affect SCI from May 2 to Vama Veche. But ML applied as an alternative defense easier by occasional sanding of the beach, could be acceptable. Existing dam to the south offers great protection and will be rehabilitated in the ML option. This would also reduce the risk to existing erosion and protection of important characteristics of the tourist resort on May 2.	Option is not appropriate for this area	**Although the front is not present device, there are many assets at risk, and erosion is in progress.** **Therefore, the best policy would be the ML. But the line can keep the integrity Bird Special Protection Area (SAP) Black Sea (a Natura 2000 site).** **Therefore, we recommend combining a light options, such as maintaining beaches with beach stabilization dams or spurs.**
	Limanu	Limanu sub-sector is a rocky and defenseless, with a narrow beach area in erosion. There are a limited number of socio-economic goods on shore. Therefore, a policy would allow continuation BE current administration regime, which means it would be appropriate for this sub-sector, where low risk for socio-economic goods.	RC Limanu option would involve the implementation of measures to slow the erosion to the cliffs. This would be a costly policy to implement, with few benefits and, therefore, not suitable for the front.	ML option to Limanu would mean building defensive elements for managing flood risk and erosion. But there are few assets at risk and socio-economic front today evolve naturally. Therefore, this policy would be inappropriate for this sub-sector.	Option is not appropriate for this area	**ML (U)** **The best policy Limanu where natural cliffs are eroding and there is little real risk, is the policy of no intervention.** **We recommend setting up a buffer zone width, to restrict future developments that could occur in the area at risk of erosion.**
	Vama Veche - (Vama	Vama Veche is characterized by relatively stable cliffs and beach. On shore there is a tourist resort and	A CR would mean implementing policy measures to slow the erosion to the cliffs. However, since the	As the front Vama Veche is defenseless now, a policy would mean building new ML defense items for flood or erosion	Option is not appropriate for this area	**FI** **Front is defenseless and there are few assets at risk. Range attraction is relatively stable**

		Veche to the border with Bulgaria)	other socio-economic goods. BE A policy would allow continued current management regime and the beach is currently stable. Therefore, this policy is considered suitable.	beach is stable and the construction of defense items would be costly compared to the value of assets at risk, this policy would be inappropriate.	risk management. This would allow erosion risk management tourist resort, but would interrupt natural coastal processes. Such a scheme would be costly and could reduce the attraction of the beach.		**at Vama Veche. Therefore, the best option would be without the intervention.**
							FI

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Sediu Central Târgovişte: Str. I.H.Rădulescu, Nr. 3-5, Mun. Târgovişte, Jud. Dâmbovița, România, 130010, Tel: +40 245 606 150, Fax: +40 245 210 852
Bucureşti: Str. Nicolae Caramfil, Nr. 87, et.3, sector 1, România, 14146, Tel: +40 31 437 01 24, Fax: +40 31 437 01 18
Constanţa: B-dul Tomis, Nr. 143 A, et. 8, Mun. Constanţa, Jud. Constanţa, România, 900591, Tel/Fax: +40 241 481 410

ANNEX 2

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Bucureşti: Str. Nicolae Caramfil, Nr. 87, et.3, sector 1, România, 14146, Tel: +40 31 437 01 24, Fax: +40 31 437 01 18
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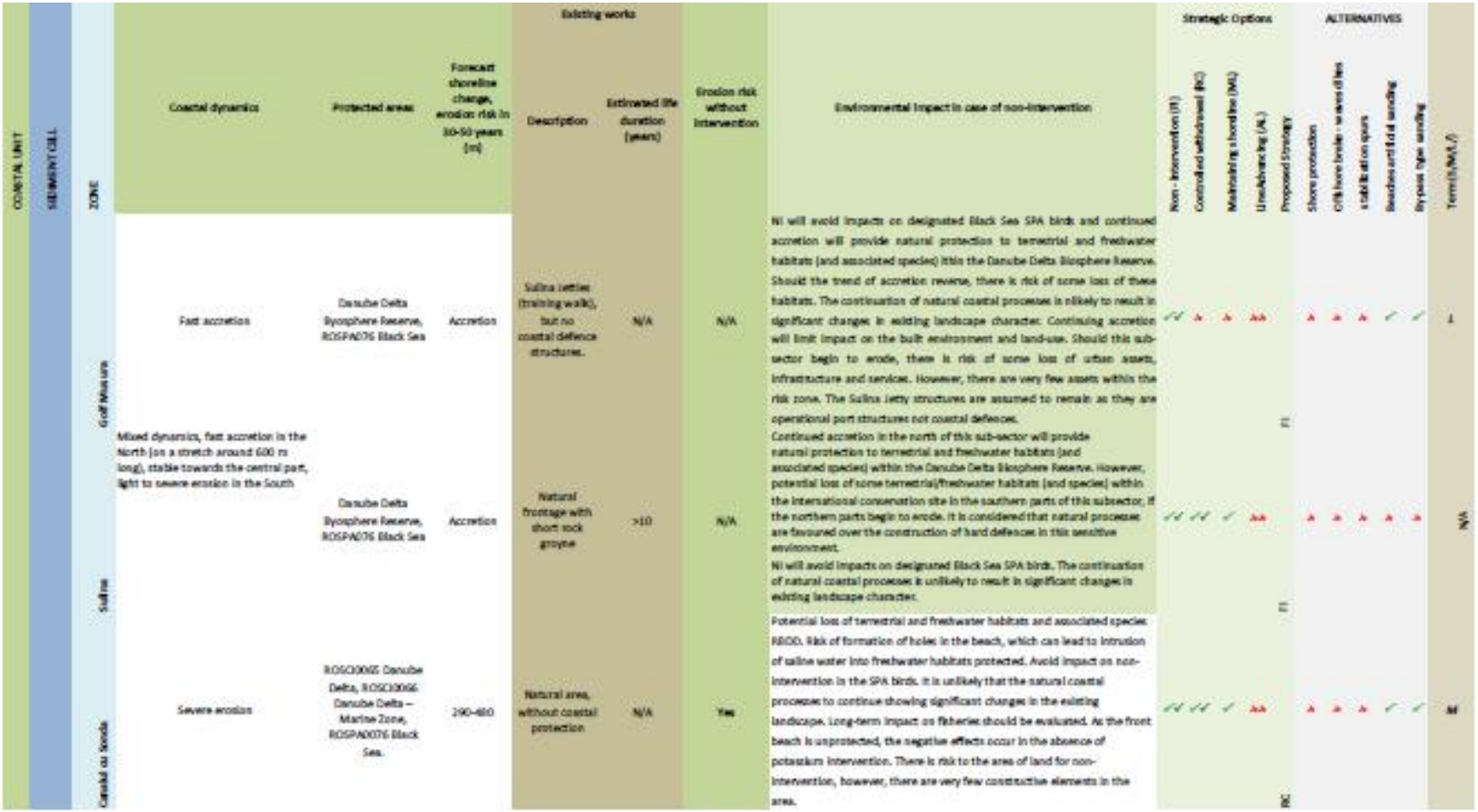

COASTAL UNIT	SEGMENT CELL	ZONE	Coastal dynamics	Protected areas	Forecast shoreline change, erosion risk in 30-50 years (m)	Existing works: Description	Existing works: Estimated life duration (years)	Erosion risk without intervention	Environmental impact in case of non-intervention	Strategic Options: Non - intervention (NI)	Strategic Options: Controlled withdrawal (RC)	Strategic Options: Maintaining shoreline (MS)	Strategic Options: Line/Advancing (LA)	Strategic Options: Proposed Strategy	ALTERNATIVES: Shore protection	ALTERNATIVES: Offshore breakw - wave dissipation	ALTERNATIVES: stabilization spurs	ALTERNATIVES: Beaches artificial nourishing	ALTERNATIVES: Hydraulic pipe sanding	Term (S/M/L/)
		Golf Musura	Fast accretion	Danube Delta Biosphere Reserve, ROSPA0076 Black Sea	Accretion	Sulina jetties (training walls), but no coastal defence structures.	N/A	N/A	NI will avoid impacts on designated Black Sea SPA birds and continued accretion will provide natural protection to terrestrial and freshwater habitats (and associated species) ithin the Danube Delta Biosphere Reserve. Should the trend of accretion reverse, there is risk of some loss of these habitats. The continuation of natural coastal processes is nlikely to result in significant changes in existing landscape character. Continuing accretion will limit impact on the built environment and land-use. Should this sub-sector begin to erode, there is risk of some loss of urban assets, infrastructure and services. However, there are very few assets within the risk zone. The Sulina Jetty structures are assumed to remain as they are operational port structures not coastal defences.	✓✓	▲	▲	▲▲	FI	▲	▲	▲	✓	✓	L
		Sulina	Mixed dynamics, fast accretion in the North (on a stretch around 600 m long), stable towards the central part, light to severe erosion in the South	Danube Delta Biosphere Reserve, ROSPA0076 Black Sea	Accretion	Natural frontage with short rock groyne	>10	N/A	Continued accretion in the north of this sub-sector will provide natural protection to terrestrial and freshwater habitats (and associated species) within the Danube Delta Biosphere Reserve. However, potential loss of some terrestrial/freshwater habitats (and species) within the international conservation site in the southern parts of this subsector, if the northern parts begin to erode, it is considered that natural processes are favoured over the construction of hard defences in this sensitive environment. NI will avoid impacts on designated Black Sea SPA birds. The continuation of natural coastal processes is unlikely to result in significant changes in existing landscape character.	✓✓	✓✓	✓	▲▲		▲	▲	▲	▲	▲	N/A
		Caraiul cu Sinoie	Severe erosion	ROSCI0065 Danube Delta, ROSCI0066 Danube Delta – Marine Zone, ROSPA0076 Black Sea.	240-480	Natural area, without coastal protection	N/A	Yes	Potential loss of terrestrial and freshwater habitats and associated species RBDD. Risk of formation of holes in the beach, which can lead to intrusion of saline water into freshwater habitats protected. Avoid impact on non-intervention in the SPA birds. It is unlikely that the natural coastal processes to continue showing significant changes in the existing landscape. Long-term impact on fisheries should be evaluated. As the front beach is unprotected, the negative effects occur in the absence of potassium intervention. There is risk to the area of land for non-intervention, however, there are very few constructive elements in the area.	✓✓	✓✓	✓	▲▲	FI RC	▲	▲	▲	✓	✓	M

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București: Str. Nicolae Caramfil, Nr. 87, et.3, sector 1, România, 14146, Tel: +40 31 437 01 24, Fax: +40 31 437 01 18
Constanța: B-dul Tomis, Nr. 143 A, et. 8, Mun. Constanța, Jud. Constanța, România, 900591, Tel/Fax: +40 241 481 410

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Bucureşti: Str. Nicolae Caramfil, Nr. 87, et.3, sector 1, România, 14146, Tel: +40 31 437 01 24, Fax: +40 31 437 01 18
Constanţa: B-dul Tomis, Nr. 143 A, et. 8, Mun. Constanţa, Jud. Constanţa, România, 900591, Tel/Fax: +40 241 481 410

UNITATEA NORDICA	Golful Musura - Jetelele de la Sulina		Casla Vadanei	Pronunced erosion which descreases towards the south part of the sector	ROSCI0065 Danube Delta, ROSCI0066 Danube Delta – Marine Zone, ROSPA0076 Black Sea.	200-320	Natural area, without coastal protection works	N/A	Yes	Potential loss of some terrestrial and freshwater habitats (and associated species) within the Danube Delta Biosphere Reserve. High erosion rates mean there is risk of a breach in the barrier beach, which may lead to saline incursion into the protected freshwater habitats. However, it is considered that natural processes are favoured over the construction of hard defences in this sensitive environment. NI will avoid impacts on designated Black Sea SPA birds. The continuation of natural coastal processes is unlikely to result in significant changes in existing landscape character. The high erosion rates mean there is risk of impact on the hinterland; however there are very few built assets in the coastal zone. There is potential for loss of access along coastal roads.	✓✓	✓	✗	✗✗	NI	✗	✗	✗	✗	✗	N/A
			Sf. Gheorghe	stable	ROSCI0065 Danube Delta, ROSCI0066 Danube Delta – Marine Zone, ROSPA0076 Black Sea.	Stabila/ acretie	Natural area, without coastal protection works	not applicable	No	Potential loss of terrestrial and freshwater habitats and associated aspecilor RBDD, dacatendinta of acretiune will slow or reverse. Non-intervention to avoid the impact on birds of SPA.Este unlikely that the natural coastal processes to continue showing significant changes in the existing landscape. Long-term impact on fisheries should be evaluated. As the front beach is unprotected, the negative effects occur in the absence interventiei.Acretiunea drinking continue to limit the impact on land use spatiului built.	✓✓	✓	✗	✗✗	NI	✗	✗	✗	✗	✗	N/A
			Sahalin	Accelerated erosion multiannual scale - decade-actually part of a process of accumulation of sediments. The southern part of the island rotates clockwise, and moving east by washing sediment island phenomena by waves	RBDD, ROSPA0076 Black Sea, SCI"Metagene structures fromSf. Gheorghe"	540-900	Natural area, without coastal protection works	not applicable	Risc mediu	Potential loss of terrestrial and freshwater habitats and associated aspecilor RBDD, dacatendinta of acretiune will slow or reverse. Non-intervention to avoid the impact on birds of SPA.Este unlikely that the natural coastal processes to continue showing significant changes in the existing landscape. Long-term impact on fisheries should be evaluated. As the front beach is unprotected, the negative effects occur in the absence interventiei.Acretiunea drinking continue to limit the impact on land use spatiului built.	✓✓	✗	✗✗	✗✗	Fara interventie	✗	✗	✗	✗	✗	N/A
		Delta secundara a br. Sf.gheorghe-Ciotic		Continue progradare as a result of accumulation of sediments transported by the Delta century arms. St. George in the lagoon behind the island of Sakhalin.	RBDD, ROSPA0076 Black Sea,	Stabila/ acretie	Natural area, without coastal protection works	not applicable	Risc mediu	Potential loss of terrestrial and freshwater habitats and associated aspecilor DDBR if acretiune trend will slow or reverse. Avoid impact on non-intervention pasarilor.Este unlikely that the natural coastal processes to continue showing significant changes existing landscape. Shelter offered by a barrier strip of sand Sahalinreprezinta, meaning that this sub-sector is unlikely to suffer severe erosion. Number of buildings at risk in this subsector is limited.	✓✓	✗	✗	✗✗	Fara interventie	✗	✗	✗	✗	✗	N/A
			Ciotic-Zatoane	Sever coastal erosion	ROSCI0065 Danube Delta, ROSCI0066 Danube Delta – Marine Zone, ROSPA0076 Black Sea.	0 - 250	Natural area, without coastal protection works	not applicable	S	Potential loss of terrestrial and freshwater habitats and associated species DDBR if acretiune trend will slow or reverse. Avoid impact on non-intervention pasarilor.Este unlikely that the natural coastal processes to continue showing significant changes existing landscape. Number of buildings at risk in this subsector is limited due to the undeveloped character of this area.	✓✓	✓	✗	✗✗	Fara interventie	✗	✗	✗	✗	✗	N/A

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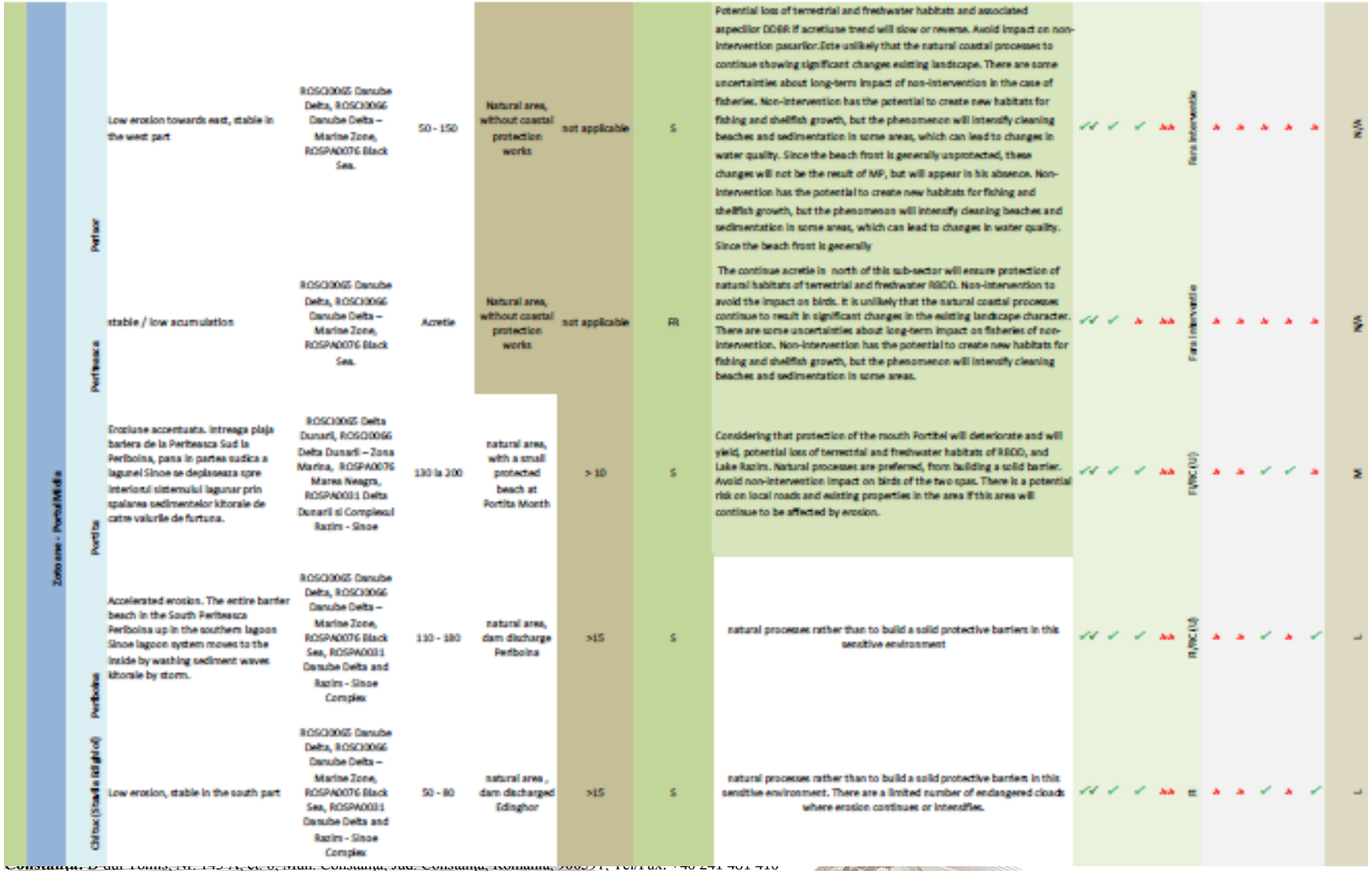
Bucureşti: Str. Nicolae Caramfil, Nr. 87, et.3, sector 1, România, 14146, Tel: +40 31 437 01 24, Fax: +40 31 437 01 18
Constanţa: B-dul Tomis, Nr. 143 A, et. 8, Mun. Constanţa, Jud. Constanţa, România, 900591, Tel/Fax: +40 241 481 410



Zona sud - Portul Midia	Periteasca	Low erosion towards east, stable in the west part	ROSCI0065 Danube Delta, ROSCI0066 Danube Delta – Marine Zone, ROSPA0076 Black Sea.	50 - 150	Natural area, without coastal protection works	not applicable	S	Potential loss of terrestrial and freshwater habitats and associated aspecllor DD6R if acretiuse trend will slow or reverse. Avoid impact on non-intervention pasarlor.Este unlikely that the natural coastal processes to continue showing significant changes existing landscape. There are some uncertainties about long-term impact of non-intervention in the case of fisheries. Non-intervention has the potential to create new habitats for fishing and shellfish growth, but the phenomenon will intensify cleaning beaches and sedimentation in some areas, which can lead to changes in water quality. Since the beach front is generally unprotected, these changes will not be the result of MP, but will appear in his absence. Non-intervention has the potential to create new habitats for fishing and shellfish growth, but the phenomenon will intensify cleaning beaches and sedimentation in some areas, which can lead to changes in water quality. Since the beach front is generally	✓✓	✓	✓	▲▲	Fara intervenție	▲	▲	▲	▲	▲	N/A
	Periteasca	stabile / low acumulation	ROSCI0065 Danube Delta, ROSCI0066 Danube Delta – Marine Zone, ROSPA0076 Black Sea.	Acretie	Natural area, without coastal protection works	not applicable	FR	The continue acretie in north of this sub-sector will ensure protection of natural habitats of terrestrial and freshwater RDD. Non-intervention to avoid the impact on birds. It is unlikely that the natural coastal processes continue to result in significant changes in the existing landscape character. There are some uncertainties about long-term impact on fisheries of non-intervention. Non-intervention has the potential to create new habitats for fishing and shellfish growth, but the phenomenon will intensify cleaning beaches and sedimentation in some areas.	✓✓	✓	▲	▲▲	Fara intervenție	▲	▲	▲	▲	▲	N/A
	Portita	Eroziune accentuata. Intreaga plaja bariera de la Periteasca Sud la Periboina, pana in partea sudica a lagunei Sinoe se deplaseaza spre interiorul sistemului lagunar prin spalarea sedimentelor litorale de catre valurile de furtuna.	ROSCI0065 Delta Dunarii, ROSCI0066 Delta Dunarii – Zona Marina, ROSPA0076 Marea Neagra, ROSPA0031 Delta Dunarii si Complexul Razim - Sinoe	130 la 200	natural area, with a small protected beach at Portita Month	> 10	S	Considering that protection of the mouth Portitei will deteriorate and will yield, potential loss of terrestrial and freshwater habitats of RDDD, and Lake Razim. Natural processes are preferred, from building a solid barrier. Avoid non-intervention impact on birds of the two spas. There is a potential risk on local roads and existing properties in the area if this area will continue to be affected by erosion.	✓✓	✓	✓	▲▲	F(V)C(U)	▲	▲	✓	✓	▲	M
	Periboina	Accelerated erosion. The entire barrier beach in the South Periteasca Periboina up in the southern lagoon Sinoe lagoon system moves to the inside by washing sediment waves litorale by storm.	ROSCI0065 Danube Delta, ROSCI0066 Danube Delta – Marine Zone, ROSPA0076 Black Sea, ROSPA0031 Danube Delta and Razim - Sinoe Complex	110 - 180	natural area, dam discharge Periboina	>15	S	natural processes rather than to build a solid protective barriers in this sensitive environment	✓✓	✓	✓	▲▲	F(V)C(U)	▲	▲	✓	▲	✓	L
	Chituc (Sinoe Edighior)	Low erosion, stable in the south part	ROSCI0065 Danube Delta, ROSCI0066 Danube Delta – Marine Zone, ROSPA0076 Black Sea, ROSPA0031 Danube Delta and Razim - Sinoe Complex	50 - 80	natural area , dam discharged Edinghor	>15	S	natural processes rather than to build a solid protective barriers in this sensitive environment. There are a limited number of endangered cloads where erosion continues or intensifies.	✓✓	✓	✓	▲▲	R	▲	▲	✓	▲	✓	L

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Golful Musura - Cap Midia pana la Portul Constanta	Corbu (cap Midia)	Arie fara acumulare	ROSCI0065 Delta Dunarii, ROSCI0066 Delta Dunarii – Zona Marina, ROSPA0076 Marea Neagra, SPA Lacurile Tasaul si Corbu	acretie	Natural area, without coastal protection works	not applicable	FR	continue to provide natural protection acretiunea terrestrial and freshwater habitats of RBDD. if you reverse the acretie risk losing habitats.	✓✓	▲	▲	▲▲	FI	▲	▲	▲	▲	▲	N/A
	Midia Port	Structures operating in the Port of Midia navigation and are not considered in this MP.	ROSCI0065 Danube delta, ROSCI0066 Danube Delta– Marine Zone, ROSPA0076 Black Sea, SPA Tasaul and	FR	epiuri breaks - wave of the port, but not protective structures	<20	FR	Port structures will remain in position	▲▲	▲▲	✓	▲	ML	▲	▲	▲	▲	▲	N/A
	Navodari Sud/Navodari Nord	stable, exposed to storms in the south - eastern direction	ROSPA0076 Black Sea	acretie	fara protectii impotriva eroziunii costiere	not applicable	FR	there is a risk of construction if erosion will continue, including some properties.	✓	▲	▲	▲▲	FI	▲	▲	▲	▲	▲	N/A
	Mamaia Nord	Cetral Gulf and all Mamaia in slightly erosion	ROSPA0076 Marea Neagra si SPA0057 Lacul Siutghiol	acretie	without protection against coastal erosion	not applicable	S	there is a risk of construction if erosion will continue, including some properties.	✓	▲	▲	▲▲	IT	▲	▲	▲	▲	▲	N/A
	Mamaia Centru	erosion - in an area with a net sediment drift south-north oriented - the area is situated in the continuation of current longhudinal dikes break after the 6 -	ROSPA0076 Black Sea and SPA0057 Siutghiol Lake	30 - 50	without protection against coastal erosion	not applicable	M	Non-intervention has an impact on birds. It is unlikely that natural processes continue to result in significant changes. Non-intervention to avoid the impact on birds. If there is a risk of erosion will continue on construction, including some resort properties	▲▲	▲	✓✓	▲▲	ML (U)	▲	▲	▲	✓	▲	M
	Mamaia Sud	Erosion, the beaches are under anthropogenic influenta	ROSPA0076 Black Sea and SPA0057 Siutghiol Lake	80 - 110	large dams wave break-	<5	M	Non-intervention has an impact on birds. It is unlikely that natural processes continue to result in significant changes. Non-intervention to avoid the impact on birds. If there is a risk of erosion will continue on construction, including some resort properties	▲▲	▲▲	✓✓	▲▲	ML(U)	▲	✓	✓	✓	▲	M
		In present this subsector is most affected by erosion	ROSPA0076 Black Sea and SPA0057 Siutghiol Lake	150 - 170	large dams and wave break and control structures in South Beach	<5	R	It is unlikely that natural processes continue to result in significant changes. Non-intervention to avoid the impact on birds. Loss of sediment from the beach, in the event that further erosion can affect the value of the tourist resort. Because there is a risk further erosion on construction, including some resort properties and local infrastructure.	▲▲	▲▲	✓✓	▲▲	ML(U)	▲	✓	✓	✓	▲	S
	Jurilovca Nord	Artificially maintained by anthropogenic intervention	ROSPA0076 Black Sea and SPA0057 Siutghiol Lake	120 - 160	New protection and recovery of land from the sea shore with small beaches beaches south of epiul without break-wave, to the south - large bays protected by dikes extended in the form of T.	<5	R	non-intervention will avoid impact on spas. Destabilization of the base of their cliffs and erosion resulting destabilization properties of cliff top. Loss sedimanteior the beach where erosion continues and gets worse, there is a risk to health and safety issues related to the degradation and break protections. Erosion of today will lead to degradation of existing buildings and local infrastructure.	▲▲	▲▲	✓✓	▲▲	ML (U)	▲	✓	✓	✓	▲	S

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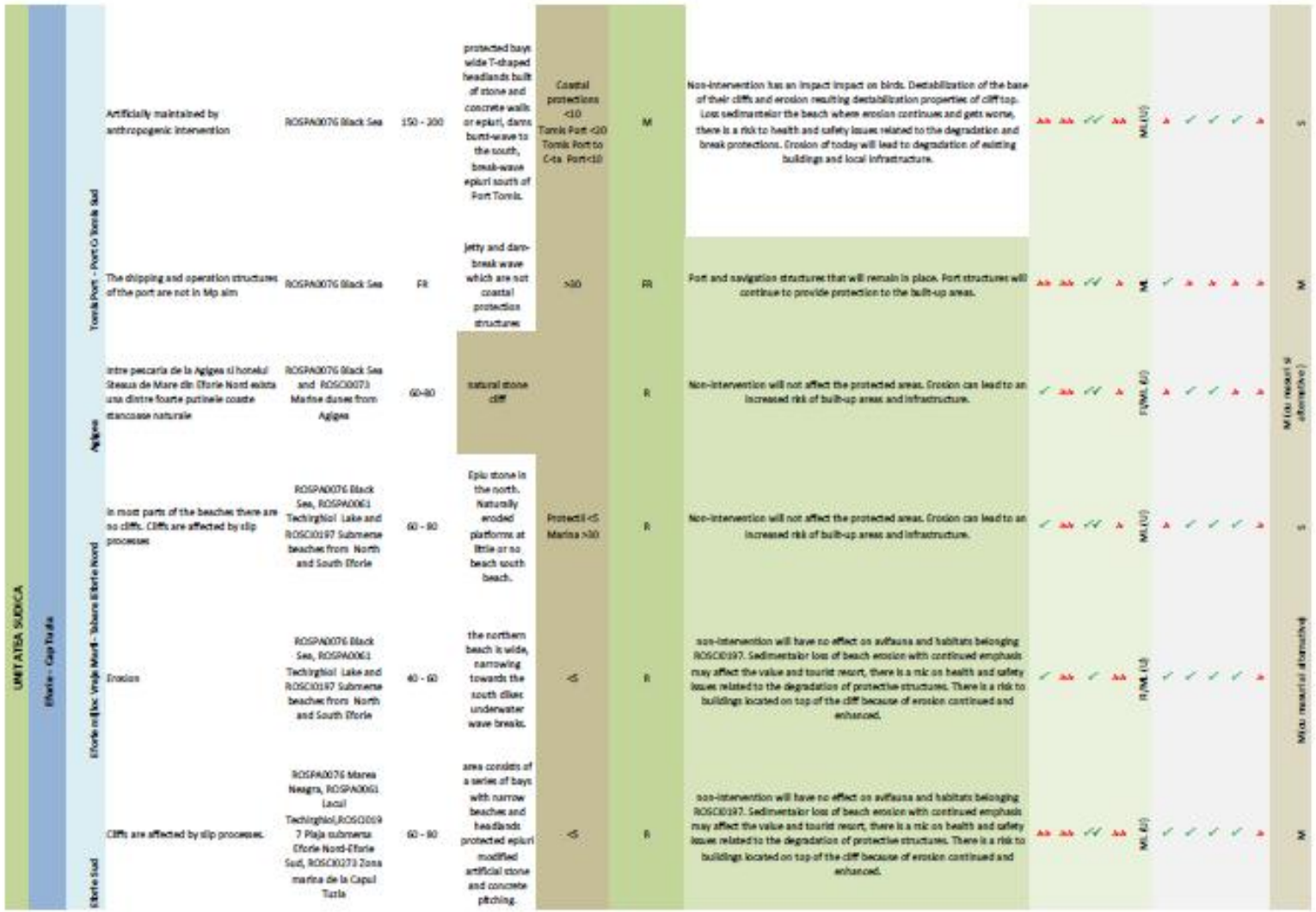
UNITATEA SUDICA
Eforie – Cap Tuzla
Eforie Sud
Eforie nord/Noc Vraja Mare8 - Tabara Eforie Nord
Agigea
Tomis Port - Port O. Tomis Sud
Artificially maintained by anthropogenic intervention
ROSPA0076 Black Sea
150 - 200
protected bays wide T-shaped headlands built of stone and concrete walls or epiuri, dams burnt-wave to the south, break-wave epiuri south of Port Tomis.
Coastal protections <10 Tomis Port <20 Tomis Port to C-ta Port<10
M
Non-intervention has an impact impact on birds. Destabilization of the base of their cliffs and erosion resulting destabilization properties of cliff top. Lost sedimentalor the beach where erosion continues and gets worse, there is a risk to health and safety issues related to the degradation and break protections. Erosion of today will lead to degradation of existing buildings and local infrastructure.
M (UE)
S
The shipping and operation structures of the port are not in Mp aim
ROSPA0076 Black Sea
FR
Jetty and dam-break wave which are not coastal protection structures
>10
FR
Port and navigation structures that will remain in place. Port structures will continue to provide protection to the built-up areas.
NE
M
Intre pescaria de la Agigea si hotelul Steaua de Mare din Eforie Nord exista una dintre foarte putinele coaste stancoase naturale
ROSPA0076 Black Sea and ROSCI0073 Marine dunes from Agigea
60-80
natural stone cliff
R
Non-intervention will not affect the protected areas. Erosion can lead to an increased risk of built-up areas and infrastructure.
F (NE-U)
Mixt (masuri si alternative)
In most parts of the beaches there are no cliffs. Cliffs are affected by slip processes
ROSPA0076 Black Sea, ROSPA0061 Techirghiol Lake and ROSCI0197 Submerse beaches from North and South Eforie
60 - 80
Epiu stone in the north. Naturally eroded platforms at little or no beach south beach.
Protectii <5 Marina >10
R
Non-intervention will not affect the protected areas. Erosion can lead to an increased risk of built-up areas and infrastructure.
NE (U)
S
Eroziune
ROSPA0076 Black Sea, ROSPA0061 Techirghiol Lake and ROSCI0197 Submerse beaches from North and South Eforie
40 - 60
the northern beach is wide, narrowing towards the south dikes underwater wave breaks.
<5
R
non-intervention will have no effect on avifauna and habitats belonging ROSCI0197. Sedimentalor loss of beach erosion with continued emphasis may affect the value and tourist resort, there is a risk on health and safety issues related to the degradation of protective structures. There is a risk to buildings located on top of the cliff because of erosion continued and enhanced.
R (NE-U)
Mixt (masuri si alternative)
Cliffs are affected by slip processes.
ROSPA0076 Marea Neagra, ROSPA0061 Lacul Techirghiol,ROSCI0197 Plaja submersa Eforie Nord-Eforie Sud, ROSCI0073 Zona marina de la Capul Tuzla
60 - 80
area consists of a series of bays with narrow beaches and headlands protected epiuri modified artificial stone and concrete pitching.
<5
R
non-intervention will have no effect on avifauna and habitats belonging ROSCI0197. Sedimentalor loss of beach erosion with continued emphasis may affect the value and tourist resort, there is a risk on health and safety issues related to the degradation of protective structures. There is a risk to buildings located on top of the cliff because of erosion continued and enhanced.
NE (U)
M

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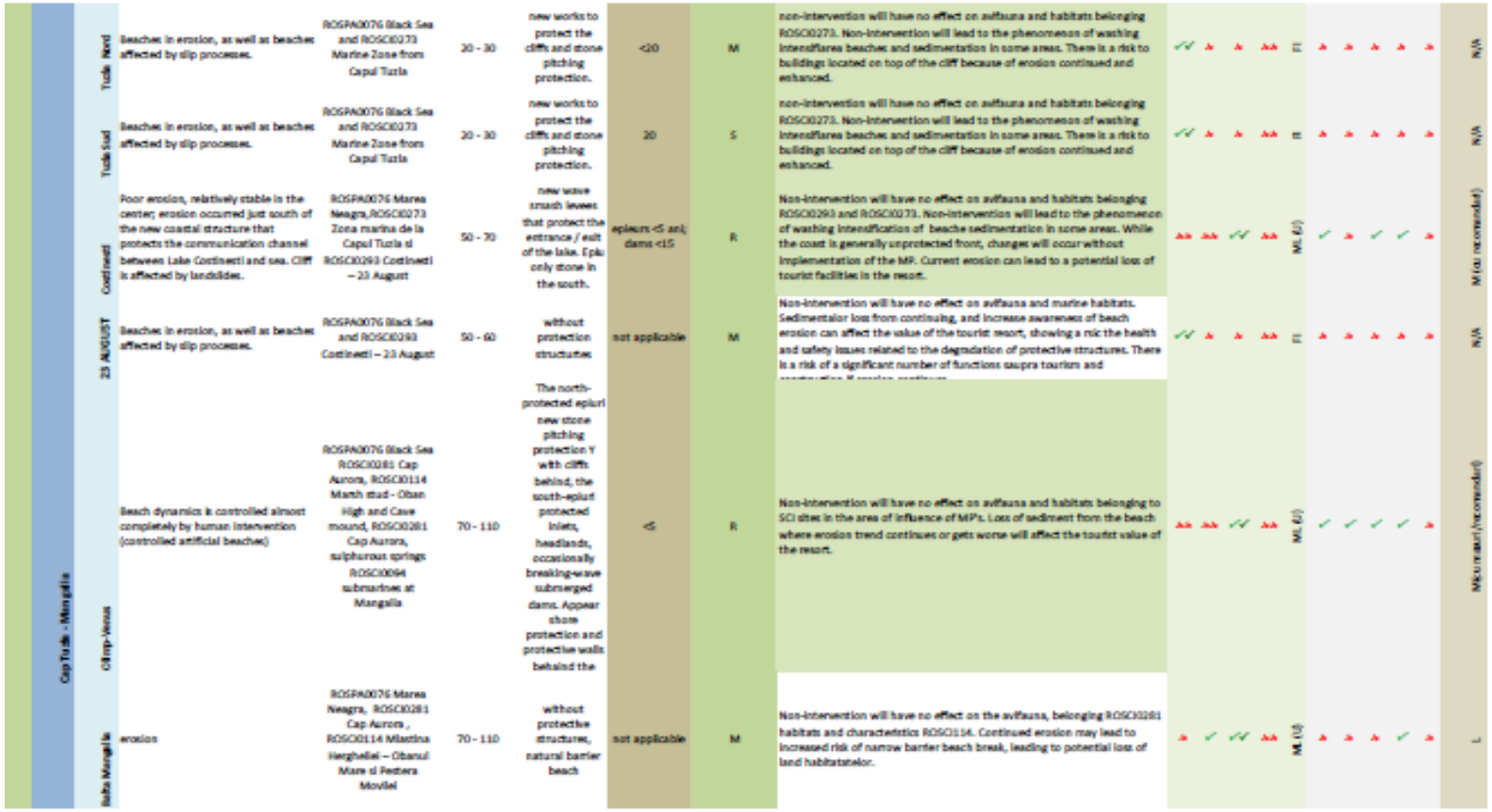

Cap Tuzla - Mangalia	Tuzla Nord	Beaches in erosion, as well as beaches affected by slip processes.	ROSPA0076 Black Sea and ROSCI0273 Marine Zone from Capul Tuzla	20 - 30	new works to protect the cliffs and stone pitching protection.	<20	M	non-intervention will have no effect on avifauna and habitats belonging ROSCI0273. Non-intervention will lead to the phenomenon of washing intensiflarea beaches and sedimentation in some areas. There is a risk to buildings located on top of the cliff because of erosion continued and enhanced.	✓✓	▲	▲	▲▲	FI	▲	▲	▲	▲	N/A
	Tuzla Sud	Beaches in erosion, as well as beaches affected by slip processes.	ROSPA0076 Black Sea and ROSCI0273 Marine Zone from Capul Tuzla	20 - 30	new works to protect the cliffs and stone pitching protection.	20	S	non-intervention will have no effect on avifauna and habitats belonging ROSCI0273. Non-intervention will lead to the phenomenon of washing intensiflarea beaches and sedimentation in some areas. There is a risk to buildings located on top of the cliff because of erosion continued and enhanced.	✓✓	▲	▲	▲▲	FI	▲	▲	▲	▲	N/A
	Costinesti	Poor erosion, relatively stable in the center; erosion occurred just south of the new coastal structure that protects the communication channel between Lake Costinesti and sea. Cliff is affected by landslides.	ROSPA0076 Marea Neagra,ROSCI0273 Zona marina de la Capul Tuzla si ROSCI0293 Costinesti – 23 August	50 - 70	new wave smash levees that protect the entrance / exit of the lake. Epiu only stone in the south.	epiuri <5 ani; dams <15	R	Non-intervention will have no effect on avifauna and habitats belonging ROSCI0293 and ROSCI0273. Non-intervention will lead to the phenomenon of washing intensification of beache sedimentation in some areas. While the coast is generally unprotected front, changes will occur without implementation of the MP. Current erosion can lead to a potential loss of tourist facilities in the resort.	▲▲	▲▲	✓✓	▲▲	ML (U)	✓	▲	✓	✓	▲	M (U) recomandat)
	23 AUGUST	Beaches in erosion, as well as beaches affected by slip processes.	ROSPA0076 Black Sea and ROSCI0293 Costinesti – 23 August	50 - 60	without protection structures	not applicable	M	Non-intervention will have no effect on avifauna and marine habitats. Sedimentalor loss from continuing, and increase awareness of beach erosion can affect the value of the tourist resort, showing a risc the health and safety issues related to the degradation of protective structures. There is a risk of a significant number of functions saupra tourism and	✓✓	▲	▲	▲▲	FI	▲	▲	▲	▲	N/A
	Olimp-Venus	Beach dynamics is controlled almost completely by human intervention (controlled artificial beaches)	ROSPA0076 Black Sea ROSCI0281 Cap Aurora, ROSCI0114 Marsh stud - Obanul High and Cave mound, ROSCI0281 Cap Aurora, sulphurous springs ROSCI0094 submarines at Mangalia	70 - 110	The north-protected epiuri new stone pitching protection Y with cliffs behind, the south-epiuri protected inlets, headlands, occasionally breaking-wave submerged dams. Appear shore protection and protective walls behaind the	<5	R	Non-intervention will have no effect on avifauna and habitats belonging to SCI sites in the area of influence of MPs. Loss of sediment from the beach where erosion trend continues or gets worse will affect the tourist value of the resort.	▲▲	▲▲	✓✓	▲▲	ML (U)	✓	✓	✓	✓	▲	M(U) recomandat)
	Baba Mangalia	erosion	ROSPA0076 Marea Neagra, ROSCI0281 Cap Aurora , ROSCI0114 Marsh stud - Obanul High and Cave mound, ROSCI0281 Cap Aurora, sulphurous springs ROSCI0094 submarines at Mangalia	70 - 110	without protective structures, natural barrier beach	not applicable	M	Non-intervention will have no effect on the avifauna, belonging ROSCI0281 habitats and characteristics ROSCI114. Continued erosion may lead to increased risk of narrow barrier beach break, leading to potential loss of land habitatatelor.	▲	✓	✓✓	▲▲	ML (U)	▲	▲	▲	✓	▲	L

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2 Md - limita frontiera Bulgaria	Saturn-Mangalia	Beach dynamics is controlled almost completely by human intervention	ROSPA0076 Black Sea ROSCI0281 Cap Aurora, ROSCI0114 Marsh stud - Obanul High and Cave mound, ROSCI0281 Cap Aurora, sulphurous springs ROSCI0094 submarines at Mangalia	70 - 110	protection of existing structures with narrow bays and beaches protected by apluri	≤5	R	Non-intervention will have no effect on avifauna and marine habitats. Sedimentalor loss from continuing, and increase awareness of beach erosion can affect the value of the tourist resort, showing a risc the health and safety issues related to the degradation of protective structures. There is a risk of a significant number of functions saupra tourism and construction if erosion continues.	↓↓	↓	✓✓	↓↓	ML (U)	✓	✓	✓	✓	↓	M
	Mangalia Port	Navigation structures and operation of the port are not included in the order MP	ROSPA0076 Black Sea	FR	jetele si digul sparge-val dar care nu sunt structuri de protectie costiera	>10	FR	Port and navigation structures that will remain in place. Port structures will continue to provide protection to the built-up areas.	↓↓	↓↓	✓✓	✓	ML	↓	↓	↓	↓	↓	N/A
	2 Md	North beach is relatively stable, being protected by the levee and the south beach has disappeared due to erosion. Cliff is affected by landslides.	ROSPA0076 Marea Neagra, ROSCI0269 Varna Veche-2 Mai	80 - 120	single coastal defense structure in rock and concret e armourunits curentlly used as a breakwater/pier by local fishermen. Elsew here, no coastal defen ces.	≤5	M	Non-intervention will not affect the fauna and protected area. It is unlikely that the natural coastal processes continue to result in significant changes in the existing landscape character. Loss of sediment from the beach where erosion or worse still may affect the value of the tourist resort. Any future development proposed for construction, including approved PUZ is in danger.	↓↓	✓	✓✓	↓↓	ML (U)	↓	✓	✓	✓	↓	M (cu recomandari)
	Limanu	Cliff is affected by landslides	ROSPA0076 Black Sea, ROSCI0269 Varna Veche-2 May	70 - 110	without protection structures	FR	M	Non-intervention will not affect the fauna and protected area. It is unlikely that the natural coastal processes continue to result in significant changes in the existing landscape character. Loss of sediment from the beach where erosion or worse still may affect the value of the tourist resort. Any future development proposed for construction, including approved PUZ is in danger.	✓✓	↓	↓	↓↓	FI	↓	↓	↓	↓	↓	N/A
	Varna Veche (granita frontiera cu Bulgaria)	The beach is relatively stable, cliff is affected by landslides.	ROSPA0076 Black Sea, ROSCI0269 Varna Veche-2 May	50 - 80	without protection structures	FR	M	Non-intervention will not affect the fauna and protected area. It is unlikely that the natural coastal processes continue to result in significant changes in the existing landscape character. Loss of sediment from the beach where erosion or worse still may affect the value of the tourist resort. Any future development proposed for construction, including approved PUZ is in danger.	✓✓	↓	↓	↓↓	R	↓	↓	↓	↓	↓	N/A

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