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CROSS BORDER MARITIME SPATIAL PLANNING FOR BLACK SEA – BULGARIA AND ROMANIA - MARSPLAN-BS II

METHODOLOGY FOR ANALYSIS AND INTEGRATION OF LAND-SEA INTERACTIONS IN THE CROSS-BORDER MSP


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WP2, Activity 2.3 Integration of Land-Sea Interactions (LSI) in MSP for the cross border region, Deliverable 1: Methodology for analysis and integration of LSI in the cross-border MSP

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1. Introduction

1.1 Aim and focus of the report

Most maritime and coastal activities are closely interrelated and so to promote the sustainable use of maritime space, Marine/Maritime Spatial Planning (MSP) should take Land-Sea Interactions (LSI) into account when developed and implemented. For example, many maritime activities also have a terrestrial component or connection, such as the shipping sector's need for ports or the grid connections required for offshore wind arrays [1]. On the other hand, activities as land reclamation, coastal developments and economic uses such as shipping, beach tourism, recreation and mining have major anthropogenic impacts on the coastal environment with direct and indirect influences on the physical interaction of the ocean with the coast [2]. Some terrestrial uses for example, beach tourism, water-front, ports, extend their domain also at the sea. Natural processes also involve interaction between land and sea, such as coastal accretion and erosion caused by currents and weather events. Human activities and natural processes therefore interact with each other in complex ways along the land-sea interface.

The coherence and integration between the planning of marine and terrestrial spaces are important and should be achieved through consistency of policies, plans and decisions [3]. For this reason, MSP should aim to manage also the maritime dimension of coastal activities and their impacts and ultimately lead to an integrated and strategic vision. When carrying out MSP, it is important to consider the dynamics that occurs between land and sea, and to ensure that spatial planning is conducted in an integrated manner across maritime and terrestrial areas. This is in the interest of both environmental protection of coastal areas and the effective development of maritime and coastal activities and uses [1].

One of the main principles of MSP is the achievement of coherence between terrestrial and marine planning and its alignment with Integrated Coastal (Zone) Management (IC(Z)M) [4]. This has been with a view to supporting both marine and terrestrial development, with coastal zones as the interface between them. This gives rise to the complex issue of LSI, where marine and land environments should be regarded as one system [5,6]. From this perspective, marine space can be considered as the physical extension of the land, with MSP as an extension of terrestrial spatial planning [7]. In practice, however, marine and terrestrial systems of planning are being undertaken separately, with limited interchange between them.

It is also a requirement of the MSP Directive (2014/89/EU)[1] for the European Union (EU) Member States (MS) to take LSI into account when preparing their maritime spatial plans. However, is has not been very specific in what this actually means and how the LSI could be integrated into MSP of each country and in different planning systems [8]. Although the concept for LSI is not completely new, it is still unclear for planners in what way to implement it in the MSP context. Further research is needed to develop the most relevant approaches to planning for and managing LSI. Considering all these issues, the LSI analysis should be an important component of MSP: it is expected to inform the planning process through the identification of the key elements linking the land and marine components of the coast to be considered when planning the sea space, i.e. LSI issues to be addressed and opportunities to be exploited [3]. All these complex elements make difficult to deal with LSI in particular from a governance perspective and in the first stage of marine planning for countries that have just started [8] and have no much experience, including also Bulgaria and Romania. Often, many knowledge gaps exist to specific LSI issues

[1]European Commission. 2014. Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 Establishing a Framework for Maritime Spatial Planning, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L0089

and administrative processes make it even tougher to link land and sea planning in multilevel/multi-sectoral administrative contexts. This is because the LSI in MSP does not only mean to identify LSI issues, but also to link land and sea planning authorities and their capacity to govern nationally and cross-border the maritime space.

This report is one of the main deliverables of the MARSPLAN-BS II project that explores the possibilities to identify and practically work on important aspects of LSI in the cross-border region of Bulgaria and Romania. The document aims to develop relevant methodology for analysis and integration of LSI in the MSP that would be used as guidance for further repetition models applicable to the national MSP plans of Bulgaria and Romania.

From such a more practical cross-border perspective, this report intends to support MSP authorities/planners in both countries with a possible common Black Sea framework for the LSI analysis and a LSI definition, identifying specific actions to be carried out in close connections with the steps of MSP process. Consequently, with specific regard to addressing the MSP Directive requirements, the ultimate scope of this document is to test/apply the proposed methodology in two case studies at the cross-border area of Bulgaria and Romania (Shabla and Mangalia). Finally, the report aims to identify important challenges and barriers in integrating LSI into national/cross-border MSP with relation to available data, methods, plans and processes; and the ways to overcome them with enablers for LSI integration. Our intention is also to synthesise the best practices and insights from countries with more advanced stages of MSP process and to formulate recommendations for further work on integrating LSI into the cross-border Black Sea MSP. Identified challenges and enablers, as well as best practices and recommendations are presented in a separate document: WP2, Activity 2.3 Integration of Land-Sea Interactions (LSI) in MSP for the cross border region, Deliverable 2: *Best practices and recommendations for further work on integrating Land-Sea Interactions into cross-border MSP.*

1.2 LSI concept: policy context and perceptions from past and current studies / projects

With the MSP Directive of 2014, the EU launched the LSI concept formally for the Member States. Each competent MSP authority should consider possible ways of addressing LSI when conducting MSP, also taking into account any transboundary context and cross-border issues.

The concept of Land-Sea Interactions is not new, however as mentioned above, its meaning still remains quite unclear in a MSP context, which consequently has made it difficult to be implemented. The LSI Synthesis Report of Pan Baltic Scope project first describes the origin of LSI concept in the EU policy context, and indeed the idea of interactions between land and sea, and to consider them in planning, is not novel [8]. This begins actually in the 1990s through the global sustainable discourse towards integrated coastal and ocean management, the Agenda 21 (chapter 17) [9]. In the EU context the ICZM was launched in the late 1990s by a number of INTERREG projects, evolving at the end in the EU ICZM Recommendation in 2002 (2002/413/EC) [10]. The term 'integrated' was used to refer the integration of objectives, instruments, policy areas, sectors, administration levels, but also integration of terrestrial and marine components of the target territory, in both time and space. A set of key principles were adopted to facilitate the development of more sustainable management of the coasts, namely [11]:

- a broad 'holistic' perspective;
- a long-term perspective;
- adaptive management (responding to new information and conditions) during a gradual process;
- local specificity;
- working with natural processes;
- participatory planning;
- support & involvement of all relevant administrative bodies;
- use of a combination of instruments.

Policy-makers and researchers in Europe have been engaged with different ICZM initiatives and projects thus creating a long-term experience. ICZM or ICM (also referred to as integrated coastal management) is a longer-standing practice than MSP that is also concerned with spatial management, but there are differences of emphasis between ICM and MSP [1]. ICM generally focuses on collaboration between, the voluntary, business and government sectors, it may result in strategies and management plans, but does not usually lead to the allocation of space to particular activities in the way that MSP may. ICM has a greater overlap with the land, often drawing in terrestrially-focused areas and bodies, whereas MSP tends not to extend its remit further inland than the high-water mark.

Although ICZM encouraged the integrated management of land and sea interface systems, and despite of integrating the initial draft proposal for the EU directive on MSP, Land-Sea Interactions have remained a challenge. **Thus, the need for integration of planning regimes across land and sea systems is evident and has received a high-level political support.**

Also, ICM/ICZM is in most contexts a voluntary practice, rather than a statutory requirement, in contrast to MSP in the EU. More generally, it is recognised that MSP and ICM should be linked where possible, as they both seek to address the problems of fragmented governance in coastal and marine settings, and have overlapping principles, such as the importance of stakeholder participation. They may therefore work together in addressing issues such as nature conservation, coastal flooding and defence, and local economic development [1].

Further, the interest in LSI has increased due to the need for its consideration in MSP, as stated in the EU MSP Directive 2014/89/EU (Article 6), through formal or informal processes such as ICM, Article 7. The EU MSP Directive 2014/89/EU specifies that the planning process should take into account land-sea interactions, however without providing a definition for LSI.

The MSP Directive makes several references to the concept of LSI in:

1) LSI are referred in recitals 9, 16 and 18 of the MSP Directive;

2) Article 1, referring to the subject matter of the Directive;

3) Article 4, paragraphs 2 and 5, pointing that when establishing maritime spatial planning, Member States shall have due regard to the particularities of the marine regions, relevant existing and future activities and uses and their impacts on the environment, as well as to natural resources, and shall also take into account land-sea interactions;

4) Article 6, paragraph 2(a) pointing that MS should take into account LSI as one of minimum requirements for maritime spatial planning;

5) Article 7, paragraph 1 Land-sea interactions, pointing that in order to take into account land-sea interactions in accordance with Article 4(2), should this not form part of the maritime spatial planning process as such, Member States may use other formal or informal processes, such as integrated coastal management. The outcome shall be reflected by Member States in their maritime spatial plans.

Nonetheless of LSI no clarity, recent initiatives, for example, in the United States and in the EU, demonstrate an increasing focus on spatial planning of both coastal and marine areas [1,2]. A number of academic and national studies, and EU funded projects have explored the various dimensions of LSI and best practice results to find relevant approaches for addressing LSI within sea basin and national contexts. For example, the ADRIPLAN project[2] found clear examples of LSI in the Adriatic-Ionian region where MSP and ICM measures needed to be strictly coordinated [12]. The Shape project for the Adriatic region also aimed to develop a basis for the protection and sustainable development of the coastal-marine environment. This project concluded that it was essential to promote MSP and ICM integration in order to improve the management of terrestrial and marine pressures, reduce impacts to the

[2] http://adriplan.eu/

marine environment and enhance protection of land-sea habitats [13]. In terms of solutions, a methodology on functional linkage between marine and terrestrial areas was developed within the project 'Coastal and Maritime Spatial Planning in Pärnu Bay Area and Coastal Municipalities of Latvia' [14]. Similarly, in Scotland, United Kingdom, some progress is being made in the management of coastal and marine resources, though continuing challenges have been identified such as: What does LSI entail? What are the perceived barriers for addressing LSI successfully? Should there be a geographic or other boundary for considering LSI [15].

Good example is also the ESaTDOR project[3] (ESPON Programme) [16] which investigated the complexity of LSI and the risks to both ecological and human wellbeing. Such perspectives emphasised the importance of governance mechanisms in the integration of sectors and administrative arrangements, particularly in transboundary contexts, and across the land-sea divide. Another example for understanding LSI is the CO-EVOLVE project[4] (INTERREG Med Programme) [17]. This aims to analyse and promote the co-evolution of human activities and natural systems in coastal areas with high touristic pressure or potential and to enhance sustainable development of tourism activities in co-existence and synergy with other coastal and marine uses.

A systematic review was performed by [18] of 151 peer-reviewed papers on governance and land-sea connections in order to examine different approaches in addressing LSI, investigate governance challenges, and provide insights into effective governance. It was found that ecosystem-based management is the most commonly referred to management approach in the context of governance and LSI. The main governance challenges include determining boundaries, addressing cross-scale effects and accessing knowledge.

In England, United Kingdom, one of the key benefits from the emergence of the marine planning system since 2009, has been the opportunity to integrate planning on land and sea (and vice-versa). This has been built into the legislation that underpins marine planning [19]. The Marine Management Organisation (MMO) must ensure that marine plans are compatible with the development plans in the land use planning system. In addition, there is a requirement when preparing a marine plan to have regard to any other plan prepared by a public or local authority in connection with the management or use of the sea or coast.

The experience from several case studies in Greece demonstrates a strong interaction between sea and land. Here, the complex socio-spatial systems were exposed to significant pressures of both natural and human-induced activities. Consequently, it is argued, an integrated terrestrial and marine spatial planning framework is needed to connect the adopted sectoral and development policies. The existence of two separate spatial planning systems (one for the land areas and one for the sea) applied in 'parallel' with numerous sectoral and development policies may lead to patchy and fragmented approaches [20]. Undoubtedly, poor integration of marine and land planning may create difficulties wherever human activities cross the land-sea divide [21]. However, marine planning is not the same as terrestrial planning, and one of the most important differences is that the sea is borderless. Seas have no physical barriers to stop the spread of pollutants, the migration of organisms, or the transfer of sediments [22]. **So, it is a bit naive to suggest that terrestrial planning can simply be replicated at the sea, because fundamental differences remain between land and sea.** Land planning is concerned with the control of rights to private space, whereas marine planning is concerned with the control of uses in common or high seas space. These differences suggest that a full merge of marine and terrestrial planning into a unified system may be unachievable [21].

[3] https://www.espon.eu/estador

[4] https://co-evolve.interreg-med.eu/

In June 2017 **the MSP Conference** ‘**Addressing Land-Sea Interactions**’ brought together over 70 national experts and MSP practitioners from across Europe to exchange experiences and knowledge through a programme of presentations and interactive sessions focusing on key LSI issues and different institutional and legislative approaches to addressing these. Over the course of the conference, 15 presentations were delivered during four sessions covering an introduction to LSI; sub-national approaches; national and sea basin approaches; as well as sectoral approaches to LSI and specific tools. The Conference report[5], published by the European Commission’s Directorate General of Maritime Affairs and Fisheries (DG MARE) considers the relationship between LSI and the MSP Directive, ICM/ICZM and MSP, and builds on the general framework for understanding land-sea interactions [1]. A briefing paper on LSI, prior the conference takes the dynamics of land-sea interactions as a starting point (**Figure 1**) and sets out various options for institutional and legislative arrangements that might be conceivable across various spatial scales. It highlights a range of opportunities for making existing institutional arrangements more connective across the land-sea interface, as well as options for a cross-border, sea basin wide approach.

The options for addressing LSI in MSP vary [1]: they could involve ICZM/ICM initiatives, harmonising terrestrial and marine spatial planning, coordinating terrestrial and marine spatial plans, or national and sea basin strategies. It is for each country or MSP authority to decide on the most appropriate mechanism for LSI to be taken into account in the MSP.

Also, several projects have recently been completed that help to elucidate the exploration of LSI. CAMP Italy project[6] [23] highlighted the double direction of LSI, land toward sea and sea toward land. The analysis of the interactions between land and marine components of the coast is therefore a key element of the ICZM process and includes ecological processes crossing the coastline delimitation, interactions among land and sea-based socio-economic activities and between human communities.

A brochure, resulting from European Commission`s study examined LSI in the planning process [24]. Potentially significant LSI have been identified for each of the eight sectors (Aquaculture, Desalination, Fisheries, Marine cables & pipelines, Minerals & mining, Ports & shipping, Tourism & coastal recreation, Offshore energy) on the basis of a desk study reviewing marine and coastal plans, projects and developments. The inclusion of LSI in the MSP Directive recognises that effective maritime spatial planning cannot take place unless consideration is given to the interface between terrestrial and marine environments. In particular, Recital 15 states that MSP should aim to ‘*integrate the maritime dimension of some coastal users or activities and their impacts and ultimately allow an integrated and strategic vision*.’ Understanding and accommodating LSI is critical to the successful delivery of MSP and cohesive management at the coast. Member States should aim through MSP to promote coherence of maritime spatial plans with other relevant processes. Addressing LSI is a key step to achieving this coherence.

One of the recent projects to deal with LSI is SUPREME[7] [3] which together with its sister project SIMWESTMED[8] [25] focused on LSI analysis and implementation.

[5] https://maritime-spatial-planning.ec.europa.eu/sites/default/files/20170927_conferencereportmalta_msp_lsi_010.pdf
[6] https://www.unep.org/unepmap/news/news/camp-italy-project-launched-three-italian-regions
[7] http://www.msp-supreme.eu/
[8] https://www.msp-platform.eu/projects/supporting-maritime-spatial-planning-western-mediterranean-region

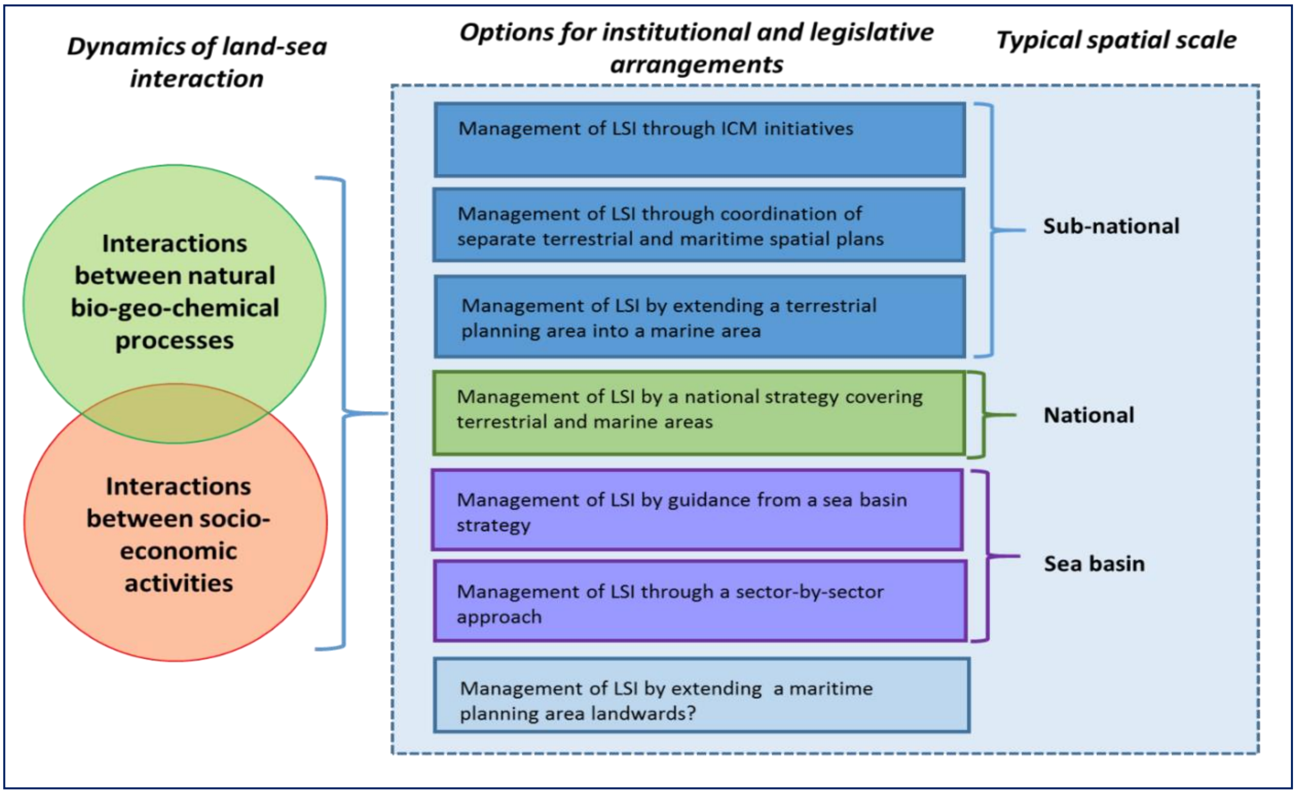


Figure 1 A General Framework for addressing Land- Sea Interactions
(*Source: DG MARE, 2017, European MSP platform*[9])

The SUPREME project developed methodological guidelines of how to analyse and integrate LSI into the MSP and promoted integration of MSP and ICZM (or how much this LSI analysis can be embedded in the wider ICZM context). The project introduced and described in detail a methodological step-by-step approach in 14 steps to perform LSI analysis in the context of the MSP plan preparation process. Both projects were funded by the European Maritime and Fisheries Fund (EMFF) (European Commission`s DG MARE and Executive Agency for Small and Medium Enterprices (EASME)).

Another recently completed project is the ESPON MSP-LSI[10] [26] on Maritime Spatial Planning and Land-Sea Interactions. It offers a comprehensive analysis of how LSI considerations can be defined and operationalised for the marine and terrestrial planning community. Conceptually, the ESPON MSP-LSI project helps understanding of LSI by unpacking it into four main elements: 1) environmental LSI processes; 2) human activities; and related 3) opportunities; and 4) risks. In the project, processes and activities are linked to related opportunities and risks that manifest both in the terrestrial and marine context. The ESPON MSP-LSI project suggests a 'one space' territorial planning as a governance arrangement that encompasses both land and sea. 'One space' planning could start with LSI scoping as a useful first stage, discussing the nature of LSI with relevant stakeholders and identifying critical issues for a more detailed examination. Analysis of critical LSI dimensions and their relevance to MSP and terrestrial planning would then serve as a basis for concrete one space planning.

Other project with regard to LSI is SIMNORAT[11] [27], also funded by the EMFF (European Commission`s DG MARE and EASME) with the main goal to support the MSP in the Northern European Atlantic and also focused a project

[9] https://www.msp-platform.eu/
[10] https://www.espon.eu/MSP-LSI
[11] https://www.msp-platform.eu/projects/supporting-implementation-maritime-spatial-planning-north-atlantic-region

activity on exploring LSI and relations with ICZM when preparing the MSP. In the scope of SIMNORAT project, land-sea interaction refers to a complex phenomenon relating to: the natural processes across the land-sea interface; the interactions between uses and activities at the sea and at the land, but also to their impacts on the quality or ecological dynamics of coastal and marine environments; the governance arrangements in these interface and socio-ecological systems.

The Pan Baltic Scope project[12], also financed by European Commission`s DG MARE and EASME under the EMFF, completed in 2019, aimed to support the development of cross-border planning practice. The LSI activity was focused to identify important aspects and challenges when practically working with LSI in Baltic Sea maritime planning and to test ways to address them, based on concrete needs of the countries that developing their maritime and coastal planning. The Pan Baltic Scope Synthesis Report 'Lessons, stories and ideas on how to integrate Land-Sea Interactions into MSP' [8] showcases how planners from the Baltic Sea have tried to tackle LSI in countries and regions at different stages of developing maritime and coastal planning. It presents experiences, challenges and enablers when integrating LSI in cross-border contexts, based on cases in Finland, Åland, Sweden, Estonia, Latvia and Germany.

One of the most recent projects, running parallel to MARSPLAN-BS II is SIMAtlantic project[13], also funded by EMFF (via European Commission` DG MARE and EASME). The project runs from 2019 to 2021, and also has the aim to explore the LSI: one of the main activities is to review and identify the best available data to support analysis of LSI and to present a tested methodology for approaching LSI in MSP. The need for maritime spatial plans to take LSI into consideration presents an opportunity for land planners to be provided with more information on LSI and what needs to be done to improve some of the issues. Summarising outcomes of discussions at the first project kick-off meeting[14] were related to two questions for research: What are the main challenges and opportunities associated with Land-Sea Interactions in the European Atlantic, including from a transboundary perspective? What role can MSP play in addressing these challenges and enhancing these opportunities?

1.3 LSI definitions and typologies

In Bulgaria, there is not exact definition for the concept of LSI in the national framework, but the legal framing is established by the Maritime spaces, Inland waterways and Ports of the Republic of Bulgaria Act[15], in which the MSP Directive was transposed in 2018, of taking Land-Sea Interactions into account when developing national MSP.

In Romania, as in Bulgaria, there is not exact definition for the concept of LSI in the national framework, but since 2002, the normative act[16] regulating the integrated management of the coastal area has been adopted. Thus, the management, protection, enhancement, sustainable development of the coastal zone and, where possible, its restoration are actions of general interest, given the variety of natural, commercial, ecological, industrial and aesthetic resources, of immediate and potential value for the present and future well-being of the nation, which it possesses.

The MSP-LSI literature/practice review revealed the absence of a widely recognised definition of LSI, instead a number of good practice examples to reflect upon mostly project-based and basin-

[12] http://www.panbalticscope.eu/

[13] https://www.simatlantic.eu/

[14] SIMAtlantic Opening Workshop: Opportunities and Risks in Maritime Spatial Planning in the European Atlantic 6th Atlantic Stakeholder Platform Conference 12–13 November 2019 – Porto, Portugal (Author: Hannah Jones, Reviewers: Stephen Jay; Version: December 2019).

[15] Maritime spaces, Inland waterways and Ports of the Republic of Bulgaria Act. 2000. Promulgated, State Gazette No. 12/11.02.2000. Last amended SG No 17/26.02.2021.

[16] Emergency Ordinance no. 202/2002 regarding the integrated management of the coastal area, approved by Law no. 280/2003.

oriented (for example Baltic Sea, Mediterranean Sea, North European Atlantic, etc.).

Almost all available LSI definitions have drawn attention to the interactions between environmental and socio-economic factors/uses across the land-sea interface, while some also include reference to governance connections/systems. In addition, **the need for a two way LSI perspective looking from the land to the sea and from the sea to the land has been encouraged**. Reference was also made to **'influence and impact'** which reflect central concerns in MSP related to both LSI opportunities and risks [28]. Considering that LSI not only involve those areas and countries directly facing the marine space, but also inner countries with important connections to the sea through complex socio-economic interactions and which might affect the marine environment through large river basin systems. This concept was in particular analysed by the 'ESaTDOR – European Seas and Territorial Development, Opportunities and Risks' study, developed within the framework of the ESPON 2013 Programme [16]. The project developed a map of European Seas showing **the hot spots of LSI**. The study focused on LSI within Europe's six regional seas and LSI was analysed considering three main features:

1) **Economic significance, based on employment in maritime sectors, used to describe the intensity of landward influences**;

2) **Flows, representing the movement of goods, services, information and people through sea areas**;

3) **Environmental pressures, representing the human impacts on the marine environment, through both sea and land-based activities such as respectively shipping or agriculture**.

Based on these, European maritime and coastal regions were categorised in five categories (**Figure 2** and **Table 1** below) according to the intensity of LSI: from European core, where land-sea interactions are at their higher intensity to Wilderness Regions where land-sea interactions are at their least intensity, also considering the intermediate levels represented by Regional hubs, Transition areas and Rural areas.

It is important to acknowledge that LSI consideration must embrace a two way perspective and respond to both opportunities and risks [26]:

• **LSI looking from the sea to the land** (for example how can seaward development be supported by conducive 'framework conditions' on land and how development on the land may have adverse impacts on the Good Environmental Status of the sea?)

• **LSI looking from the land to the sea** (for example how can landward development be supported by marine development and how development and environmental conditions in the sea may have adverse impacts on the health and wellbeing of landward communities?)

The general Framework for LSI developed by the European Commission`s DG MARE [1] describes **LSI** as '***a complex phenomenon that involves both natural processes across the land-sea interface, as well as the impact of socio-economic human activities that take place in this zone***'. The DG MARE Briefing paper within this developed framework at the Malta Conference in 2017 grouped the interactions between land and sea as occurring between natural bio-geo-chemical processes, or interactions between socio-economic activities. These dynamic interactions highlight the complexity in which LSI needs to be addressed, especially when they occur in parallel (**Figure 1**):

1) **Interactions between natural bio-geo-chemical processes:** such interactions between natural processes can include for example agricultural run-off resulting in eutrophication of coastal waters, or land-based pollution associated with industrial / agricultural activities affecting the quality of coastal waters. Key LSI issues relating to natural processes identified during the conference are coastal erosion (including coastal defence and coastal change) and pollution from landward activities, e.g. the impact on the good environmental status of the marine environment and associated human activities (such as land-based sources of water pollution and marine litter and the subsequent impacts on marine species / habitats, shellfisheries / aquaculture, bathing waters).

Climate change and associated sea level rise are also key LSI issues, related to natural processes, such as increased impact of extreme storms and sea floods on coastal infrastructure, intrusion of salt water into freshwater systems, etc. At the same time, **human activities can interfere with natural processes**. The analysis of the expected impacts of land and maritime activities should include the evaluation of their effects on LSI natural processes and the potential consequent effects on natural resources and ecosystem services.

2) **Interactions between socio-economic activities:** such interactions include for example maritime uses that need support installations on land, also some uses existing mostly on land (e.g., tourism, recreation, ports) expand their activities to the sea as well. These interactions need to be understood, in order to assess their individual and cumulative impacts and potential conflicts and synergies. These interactions have been studied on national and regional scales in government and EU funded projects.

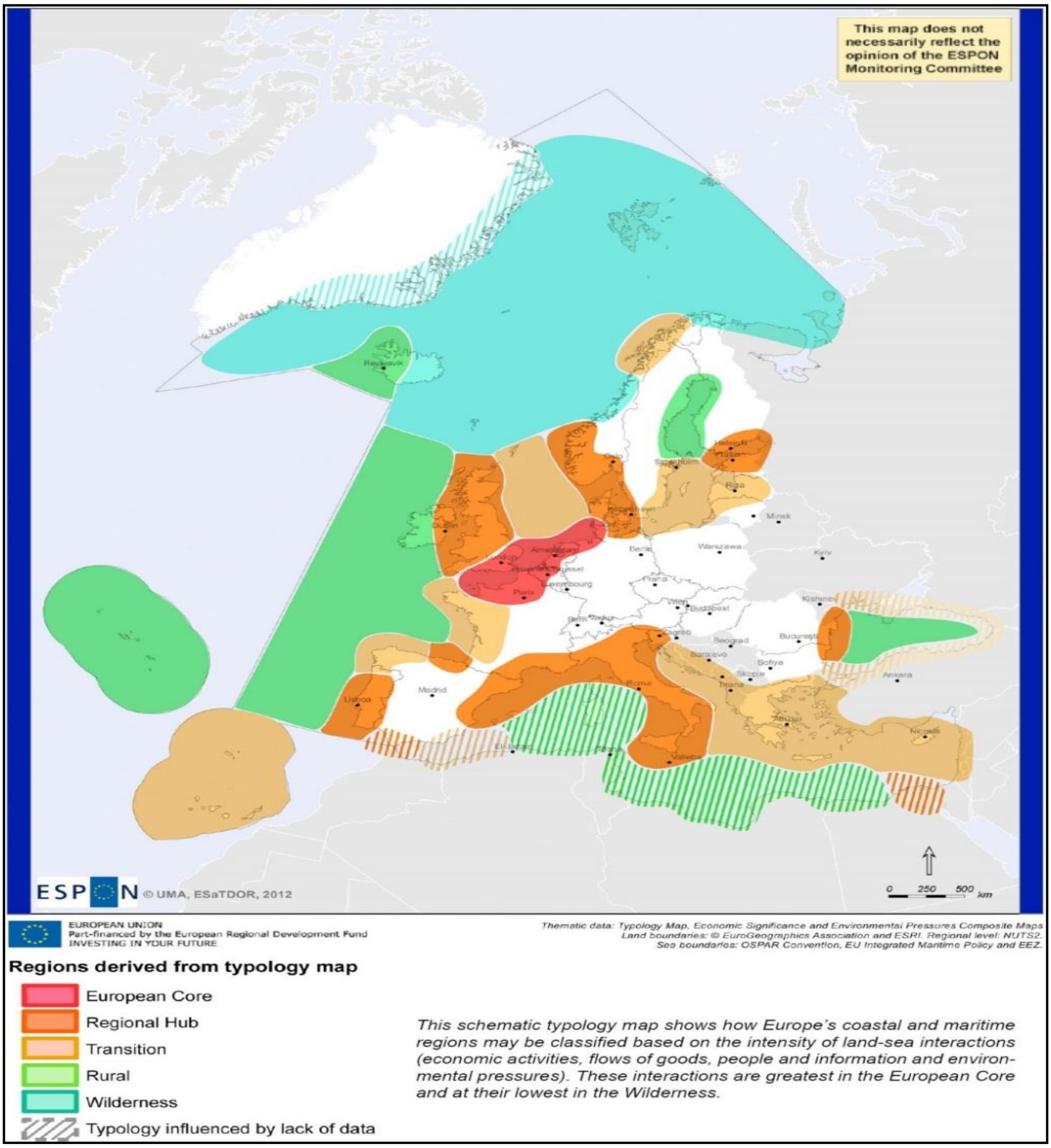


Figure 2 Classification of maritime and coastal regions according to the intensity of LSI
Source: ESPON and University of Liverpool (2013) [16]

Table 1 Typologies of maritime and coastal regions according to LSI intensity and their main characteristics

	EUROPEAN CORE	REGIONAL HUB	TRANSITION	RURAL	WILDERNESS
Economic Significance	Greatest concentration of maritime employment/ high strategic economic importance.	High maritime employment, significant economic importance.	More localised concentrations of maritime employment/ more dependent upon a limited number of strategic industries.	Low levels of maritime related employment, economy dominated by primary production and tourist sectors.	Very low and intermittent levels of maritime employment, limited direct economic importance.
Flows	Great international connectivity, global hinterland.	Nationally significant and some international connections, European scale hinterland.	Nationally and regionally significant connections and hinterland.	Limited connectivity, local/ regional hinterland with some more significant sectors/ seasonal extensions.	Remote areas, limited connectivity. Very small local hinterland, some extensions.
Environmental Pressures	High environmental pressure associated with human uses.	Significant environmental pressures.	Medium environmental pressures.	Low environmental pressure.	Limited environmental pressure.
Land-Sea Interactions	**Very high**	**High**	**Medium**	**Low**	**Very low**

Source: ESPON and University of Liverpool (2013)

In the scope of SIMNORAT project [27], land-sea interaction refers to a complex phenomenon relating to:

- the natural processes across the land-sea interface;
- the interactions between uses and activities at the sea and at the land, but also to their impacts on the quality or ecological dynamics of coastal and marine environments;
- the governance arrangements in these interface and socio-ecological systems.

Possible Land-Sea Interactions of some typical maritime sectors are described in the brochure prepared by Shipman et al., 2018 [24] for the DG Environment of the European Commission. Three broad categories of LSI have been identified: environmental, socio-economic and technical. For each potentially significant LSI, the study has considered: i) Sources of information that can assist the consideration of the LSI; ii) Existing policies and guidance that are relevant to the consideration of the LSI; iii) Assessment tools that can be used to analyse the LSI; iv) Potential mitigation measures that might be applied to minimise negative impacts or maximise positive impacts; v) Stakeholders that should be engaged in discussions around the LSI; and vi) Options for addressing the LSI through plan making. The study identified that when addressing LSI planners need to consider: Vertical, geographical and sectoral separation of decision making; Role and engagement of private/commercial sectors; Using the Ecosystem-Based Approach (EBA); Scale and availability of data; Political context; and Expected climate change impacts.

Within the SUPREME project the transposition of MSP EU Directive in the Italian legislation is given by the Decree 201/2016. Herein, in the article 3, LSI is intended as the '*interactions in which terrestrial natural phenomena or human activities have an impact on the marine environment, resources and activities and interactions in which marine natural phenomena or human activities have an impact on the terrestrial environment, resources and activities*' [3].

In parallel to the ESPON MSP-LSI project, the Pan Baltic Scope approach emphasised the land-sea planning continuum ('one space') encompassing both MSP, ICZM and land-based planning [8]. At its heart is the development of a conceptual framework with four main dimensions of LSI:

1. Uses and interactions with (in) the environment;

2. Governance systems;

3. **Process management**; and

4. Knowledge, methods and tools.

Overall, structured along these four main dimensions of LSI the project addressed the following most important aspects: 1) identifying land-sea issues and linkages in terms of spatial needs and interactions also across sectors, over time and across borders, 2) getting the institutional mandates and structures right and promoting institutional capacity for multi-level governance across the land-sea boundary (especially with local authorities as crucial links), 3) identifying, informing and mobilising the relevant stakeholders and linking them (also across borders), and 4) getting spatial datasets that reach across the land-sea boundary at the right scale to produce planning evidence that can be shared across levels and borders. The Pan-Baltic Scope definition respectively is the following: '*the term land-sea interaction(s) in coastal and marine spatial planning encompasses all natural and human-induced flows and processes between marine and terrestrial environments in both directions, as well as how these interactions are perceived and managed by societies and their different actors through MSP and other governance frameworks and processes (i.e. authorities, enterprises, users, Non-governmental Organisations (NGOs) and what they do about these interactions)*'.

2. MSP and LSI at national level (different institutional systems and planning stages)

The European Commission`s DG MARE Conference Report in 2017 [1] showed for the first time many different institutional and legislative approaches to addressing natural and socio-economic key issues for LSI. For example, sub-national approaches can include **ICM/ICZM initiatives**, which are already established and put in place, **coordination of separate terrestrial and maritime spatial plans** (some countries have chosen to maintain separate terrestrial and marine planning systems whilst still ensuring LSI are taken into consideration), or **extending a terrestrial planning area into a marine area** (local and regional scale territorial plans can also extend to the marine environment with a view to include LSI within these areas). Another approach is to manage LSI through the creation of a **national strategy which encompasses both the terrestrial and the marine environment**. This is the approach taken by the Netherlands, for instance. Malta also has a similar approach through their Strategic Plan for Environment and Development, an overarching document covering both land and sea which also acts as the national Maritime Spatial Plan. **LSI can also be managed on a larger, sea basin scale**. For example, in the Baltic Sea Region, VASAB[17] develops long-term strategies and visions for the region, including spatial planning and development. In the Mediterranean, UNEP-MAP[18] is taking LSI on board, in particular through Priority Actions Programme/Regional Activity Centre (PAP/RAC), which is specifically focused on the implementation of the ICZM protocol. This protocol expressly includes territorial waters within its geographic scope, creating a direct link to MSP. LSI can also be managed **by a sector-by-sector approach**, such as oil and gas, and tourism, sometimes operating at a sea basin scale.

[17] https://vasab.org/

[18] https://www.unenvironment.org/unepmap/, http://paprac.org/iczm-protocol, also see: Bocci, M., Ramieri, E., Markovic, M. 2018. How to perform analysis of land-sea interactions, combining MSP and ICZM in the considered project area. Supreme Project.

Another approach is to extend a maritime planning area landwards? It is also technically possible to address LSI by extending the remit of MSP inland, landwards of the high-water mark (in contrast to extending a terrestrial planning area seaward). However, this would reflect on existing terrestrial planning systems and this is not an approach that appears to have been adopted so far.

Each approach has its strengths and challenges. Also the LSI can be addressed at a variety of spatial scales, including [1]:

• **Local areas**, such as ICM/ICZM partnerships and economically-driven initiatives, involving municipalities and other local interests

• **Sub-national planning territories**, such as maritime plan areas, involving MSP authorities working in collaboration with coastal and maritime stakeholders

• **National territories**, where a national strategy or plan, covering the whole of the nation's waters, and possibly its land area as well, may guide LSI efforts

• **Sea basins / transnational regions**, where transnational cooperation may produce a strategy or protocol for guiding national LSI efforts and ensuring ongoing cross-border cooperation

These scales are not mutually exclusive. For example, higher-level strategies may be implemented or supplemented at a sub-national or local level by other instruments for addressing LSI. It should also be recognised that spatial scales vary between Member States. In some contexts, the sub-national (regional) scale of governance is of great importance, whereas for other Member States only the local and national scales of governance exist. It is for each country / MSP authority to decide on the most suitable level(s) of governance for taking LSI into account in MSP processes, giving consideration to existing institutional arrangements for spatial planning and management.

Although Bulgaria and Romania have started together with the transposition of the EU MSP Directive into national legislations, and have continued with the same time frame of MSP circle of the national planning, the countries have different institutional systems and planning legislations, as well as different LSI approaches. **The complex pattern of responsibilities between land and sea has been identified as another key issue of concern when it comes to LSI interactions** [1]. There seems to be a concern for a general lack of integration/coherence regarding the application of European legislation such as the MSP Directive, the Marine Strategy Framework Directive (MSFD)[19] and the Water Framework Directive (WFD)[20] as well as other pieces of European legislation and strategies. There has been also uncertainty about who is responsible for what and thus there is often a mismatch between administrative boundaries and the scale of natural and socio-economic LSI processes that need to be considered in the marine planning. The chapter below provides an overview of the institutional frameworks and terrestrial and sea planning in Bulgaria and Romania.

2.1 National approaches to LSI in Bulgaria and Romania

Bulgaria

Bulgarian coastal zone and marine space are currently organised and planned under various legal acts, but for the complex LSI, an integrated approach is needed to consider all potential conflicts and synergies across land and sea.

Structure and responsibilities:

1. What is the geographical scope of the MSP plan in Bulgaria: does it apply to internal waters, territorial waters and Exclusive Economic Zone (EEZ)? How far does it apply

[19] European Commission. 2008. Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008, establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056

[20] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060

landward in the coastal zone, does it stop at the coastline?

In Bulgaria the MSP process has been started and the Directive 2014/89/EU was transposed in early 2018 in the national legislation by an Amendment of the Maritime Spaces, Inland Waterways and Ports of the Republic of Bulgaria Act[15]. The geographical scope of the Maritime Spatial Plan of the Republic of Bulgaria is defined in Art. 51a of this Act. **It includes sea areas of the country according to Art. 5, para. 1 of the Act, as well as the coastal sea waters according to § 1, item 54 of the Additional provisions of the Water Act[21].**

The maritime areas of Bulgaria include the internal sea waters, the territorial sea, the contiguous zone and the EEZ (**Figure 3**). Coastal waters are surface waters situated '*on land from the coastline, each point of which is one nautical mile towards the interior of the sea from the nearest point of the baseline, from which the territorial sea is measured, while, where possible, continue to the outer limit of transitional waters*'.

Although the adjacent onshore areas are not indicated in the Act, for the purposes of the Maritime Spatial Plan they will be presented within the zones for special territorial protection defined by the Black Sea Coast Spatial Development Act[22] (zones 'A' and 'B', respectively 100 m and 2 km, and the adjacent waters in the area with a width of 200 m). This scope includes important sites and facilities of transport, tourism, technical and port infrastructure, which are related to the development of activities in the Black Sea and which have an impact on the quality of the marine environment and the services offered.

This is due also to the fact, that the EU MSP Directive 2014/89/EU requires the LSI consideration in MSP, (Article 6), through formal or informal processes such as ICZM (Article 7).

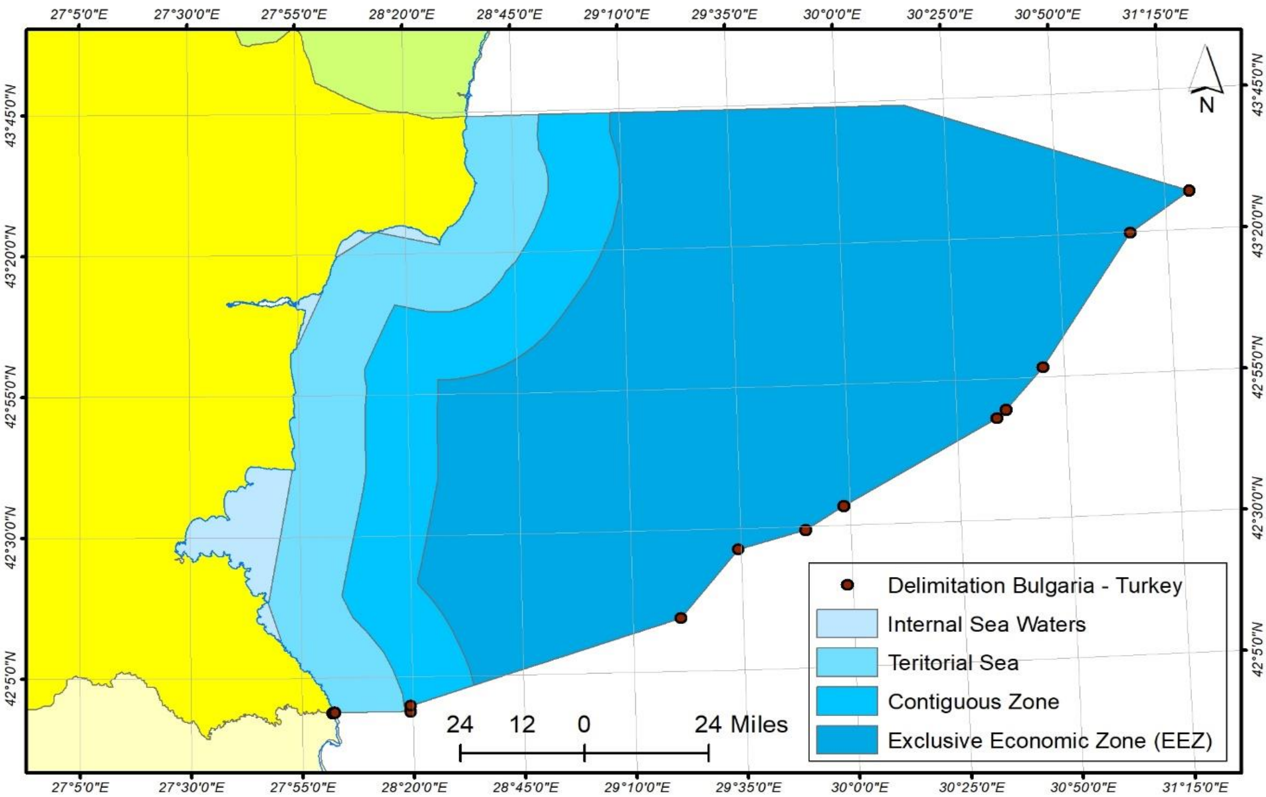


Figure 3 Maritime delimitations and jurisdictions of Bulgaria (*Map produced by CCMS)*

[21] Water Act. 2000. Promulgated in State Gazette No 67/27.07.2000. Last amended by State Gazette No. 21/13.03.2020.

[22] Black Sea Coast Development Act. 2008. Promulgated, State Gazette No. 48/15.06.2007. Last amended SG No 21/13.03.2020.

The land boundary of the plan changes according to specific requirements and scope of the initial data for the purposes of the analysis of the marine environment and the adjacent coastal zone - from the border of the Black Sea municipalities for demography and other indicators on which data are collected at municipal level, till the defined beach boundaries, when exploring the recreational capacity of the coast.

The MSP plan does not envisage new constructions or changes in the land use of the coastal territory, which is subject to the Master Plans of the 14 Black Sea municipalities. It provides basic strategic guidelines for consideration of the land-sea interactions and for coordinating the maritime activities.

The plan does not result in implementation of investment initiatives, which are planned and processed within the legal framework for spatial planning (Spatial Development Act[23] , Black Sea Coast Development Act, and Maritime Spaces, Inland Waterways and Ports of the Republic of Bulgaria Act). The Maritime Spatial Plan complies with the priorities of community, regional, national and local documents related to the sustainable development of maritime areas **(Figure 4)**.

2. The MSP Competent Authority in Bulgaria is responsible for planning the sea area from the shoreline outwards, whereas the municipalities are responsible for planning onshore?

The institutional framework of MSP in Bulgaria is defined in Section VII 'Use of maritime areas and protection of the marine environment' of the Maritime Spaces, Inland Waterways and Ports of the Republic of Bulgaria Act. According to Art. 51b 'the general management and coordination of the maritime spatial planning activity shall be carried out by the Minister of Regional Development and Public Works (MRDPW), who shall also be responsible for the elaboration and maintenance of the Maritime Spatial Plan of the Republic of Bulgaria'.

The development and planning of the territory of the coastal municipalities is also carried out under the leadership of the Minister of Regional Development and Public Works, who according to Art. 124 para. 2 of the Spatial Development Act, gives permission for elaboration of a Master plan of a settlement formation of national importance (the national sea resorts Albena, Golden Sands, St. St. Konstantin and Elena, Sunny Beach, holiday village Duni, International Youth Centre - Primorsko) and the 14 Black Sea coastal municipalities. The spatial planning in coastal municipalities is carried out jointly with the municipal local administrations. The Municipal council adopts a decision for elaboration of a Master plan after coordination with the Minister of MRDPW and upon a proposal of the mayor of the municipality, accompanied by a Term of References under Art. 125. The Ministry of Environment and Water (MoEW) and the Ministry of Culture, as well as the respective regional, district and municipal subdivisions of the MoEW, the Ministry of Culture, the Ministry of Agriculture, Food and Forestry, the Ministry of Health and the Ministry of Transport, Information Technology and Communications take part in the coordination and approval of the municipality Master Plan.

The plans of the ports for public transport and their amendments are being prepared in accordance with the requirements of Ordinance № 10/2014. According to Art. 3 para. 2, they are being prepared and approved as a detailed plan for regulation and construction of the port territory and a plot plan for the port water area. Their processing is being carried out in accordance with the Spatial Development Act, and the municipalities participate in their approval.

[23] Spatial Development Act. 2001. Promulgated State Gazette No. 1/02.01.2001, last amended by State Gazette No. 101/27/12/2019.

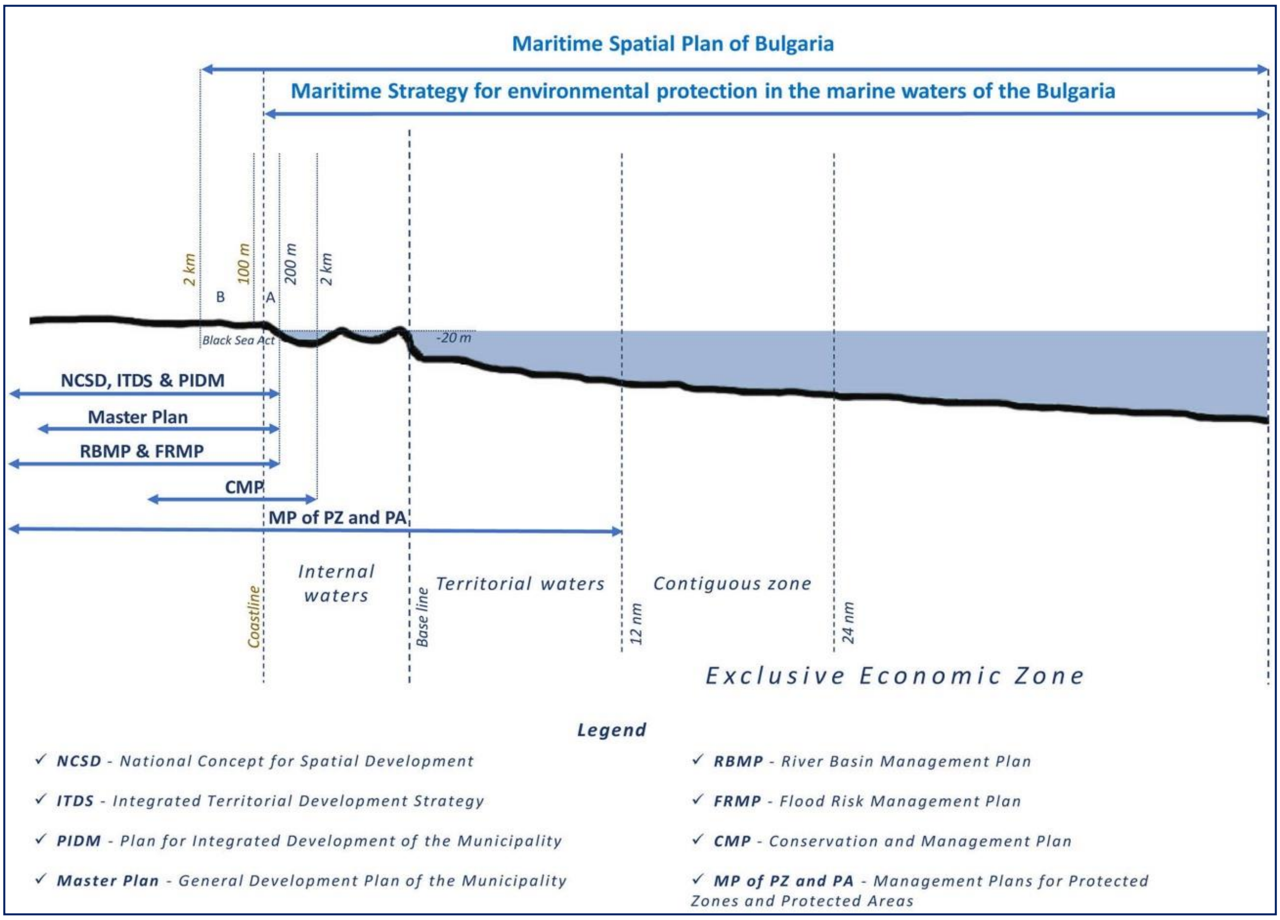


Figure 4 Planning system and boundaries for coastal and MSP in Bulgaria (*provided by NCRD and MRDPW, MSP Competent Authority*)

3. Does MSP overlaps and complements regional/municipal planning in adjacent territorial and onshore waters? Does the national MSP overlaps with the established municipal onshore and land planning?

Thus, the Maritime Spatial Plan does not overlap with the Master Plans of the municipalities according to the transposed texts of Directive 2014/89, but should consider the interactions with the coastal zone and its integrated management, or the land-sea and sea-land interactions. Therefore, on the one hand, the MSP takes into account to a different extent the development of coastal areas and the impacts on the state of the marine environment, and on the other hand, municipality plans address issues, related to the protection and use of adjacent sea waters, where the main recreational activities, water sports and attractions take place.

Similarly to the Concept for Spatial Development for the period 2013-2025 (Updated, 2019)[24], the Maritime Spatial Plan of Bulgaria for the period 2021-2035, also determines the guidelines for the development of plans from the lower hierarchical levels. On the other hand, the provisions of the Integrated Territorial Development Strategies of the two Black Sea NUTS 2 planning regions - Northeast and Southeast, as well as the Plans for Integrated Development of Black Sea Municipalities should be taken into account, according to Art. 8 para. 3 of the last edition and amendments of the Regional Development Act[25], with their largest strategic investment projects.

[24] http://www.ncrdhp.bg/wp-content/uploads/2017/02/2015_NCSD_METREX.pdf

[25] Regional Develoment Act. 2008. Promulgated State Gazette No 50/30.05.2008, last amended by State Gazette No 21/13.03.2020.

The territorial impacts on the sea areas are considered in accordance with the Black Sea Coast Development Act. In Bulgaria, marine planning by a municipality is not possible because the Spatial Development Act and other national legislation do not provide a basis for extending the boundaries of a municipality to the territorial sea. The Directive 2014/89/EU for establishing a framework for maritime spatial planning does not interfere with Member States' competence for town and county planning, including any terrestrial or land spatial planning system used to plan how land and coastal zone should be used. Even though the municipalities in Bulgaria have no mandate to plan the sea, they plan some onshore developments, activities and infrastructure, restrictive regimes, the general regime for water and recreational resources uses, the necessary measures for coastal protection, the specific requirements, rules and regulations for planning of the sea area.

The Black Sea Coast Development Act envisages the development of specialised schemes for the adjacent sea area to the comprehensive and detailed development plans, in accordance with the forecasts of the Maritime Spatial Plan. This details the sanitary protection zones, water sports areas, underwater archaeology and underwater tourism areas, coastal protection and sea defence structures, as well as other facilities or sites, related to the tourist coastal activities and commercial fishing. They also depict the areas in which the country's national security and defence activities are being carried out.

The other group of documents relevant to maritime spatial planning are the above-mentioned Integrated Territorial Strategies for Development for NUTS 2 planning regions and the Plans for integrated municipal development. They set out the most important projects on which the development of the economy, social cohesion, environmental protection, and the development of technical infrastructure depend.

4. What are the roles/responsibilities and mandates of municipalities in planning coastal zone and onshore waters (in case there is established municipal planning of adjacent onshore waters and this overlaps with MSP, then the Directive does not apply?

The mandate of the municipality in planning of the coastal zone and sea waters is defined by the Spatial Development Act and the Black Sea Coast Development Act in relation with their responsibility of preparing Master plans. The municipalities are also in charge for the assignment of the Ecological Assessment of the Master plans. The implementation of the Master plans and the implementation of the envisaged measures in the Environmental Impact Assessment Reports are being monitored, controlled and reported annually through a report of the municipality mayor to the MoEW/Regional Inspectorate for Environmental Waters respectively. The municipalities are also the assignors of the Plans for Integrated Development of the municipalities, which combine the Municipal Development Plans and the Integrated Plans for urban regeneration and development of the cities from 2nd to 4th hierarchical level, according to the last amendment of the Regional Development Act.

5. Even though the municipalities have no mandate to plan the sea, they plan activities and infrastructure on the shore, such as piers, marinas, docks, and beaches. Some municipalities plan also the adjacent internal waters of port areas and infrastructure and thus overlapping/complements with national MSP?

It is possible the national Maritime Spatial Plan to be further developed and detailed in separate fragments of coastal zone and sea waters with accumulation of most conflict zones and critical points, as well as in the new generation of Master Plans of the Black Sea municipalities, developed according to the requirements of the Black Sea Coastal Development Act. Among the approved plans are the Amendments to the Master Plans of Varna, Sozopol, Primorsko and Balchik municipalities, as well as the Master Plans of Shabla and Tzarevo municipalities, which are in their last stages of public discussion. These plans include schemes for the adjacent water areas, according to art. 22 para. 1 of the Black Sea Coast Development Act.

The role of ICZM in considering LSI:

Management of the land-sea interface has been promoted at a European level through the process of ICM or ICZM as a process for the management of the coast using an integrated approach, regarding all aspects of the coastal zone, including geographical and political boundaries, in an attempt to achieve sustainability. ICM/ICZM has a greater overlap with the land, often drawing in terrestrially-focused areas and bodies, whereas MSP tends not to extend its remit further inland than the high-water mark. Although ICM is in most contexts a voluntary practice, rather than a statutory requirement, in contrast to MSP in the EU, the tools developed by ICM/ICZM are important in the identification, assessment and management of LSI to ensure the economic, social and environmental sustainability of Europe's coastal regions [24].

ICZM in Bulgaria covers several periods and respectively projects, funded by international institutions or programmes. The beginning is connected with the joint Programme for Integrated Coastal Zone Management of the Ministry of Regional Development and Public Works and the World Bank, co-financed by the Global Environment Facility, 1996-1998. According to this complex programme, the first version of the Black Sea Coast Development Act was elaborated and adopted almost 10 years later; experts were trained and equipped for one national and two regional units for ICZM (Varna and Burgas), a common Regional Scheme for the Black Sea coast, 14 Land Use Plans (LUPs) of the Black Sea municipalities were prepared, on the basis of the first digital cadastral frames, GIS for the LUPs were applied for the first time and an Environmental Impact Assessment (EIA) of the LUP was made; the first broad public discussions took place. Without being explicitly written in the ToR as a requirement for the contents of the Land Use Plans, a significant part of them also consider the connection between the coastal zone and the sea.

The Netherlands Ministry of Environment, Housing and Construction developed the Preliminary studies for the preparation of the ToR in 2006, as a prerequisite to the national document for integrated coastal zone management for the Bulgarian Black Sea coast. The LSI linkage was poorly represented in these studies. The project mainly focused on the results of public consultations with stakeholders.

Two ministries of Republic of Bulgaria were responsible for decision-making on ICZM and spatial development: Ministry of Regional Development and Public Works, and Ministry of Environment and Water. Many research and cooperation projects have been realised at both EU and Black Sea cross-border scale. The themes developed concern the sustainable development, sustainable transport and tourism, climate changes impact, environmental protection, ICZM in Black Sea region, etc. [11]

Progress in implementation of ICZM Principles (before adopting MSP Directive in 2014):

The National Environmental Strategy and Action Plan (2009-2018)[26] includes the priority goal of an integrated management of water resources in the coastal areas of the Black Sea, based on an ecosystem approach (Principle 1). The competences were scattered among different institutions involved in the integrated coastal zone management, sustainable development and marine environmental protection. The coordination, necessary for the achievement of the Principle 1 occurs within the framework of the activities of Black Sea Environment Programme[27] (BSEP). No significant progress was made in the long term perspective (Principle 2) and in the adaptive management (Principle 3), even though the National Conservation Action Plan, taking into account adaptation of the biodiversity to climate change is some attempt in the recommended direction. The municipal bodies (Principle 4) play an important role in the implementation of the policy in the environmental sector and in this respect their main functions are related to the development of environmental protection programmes, the

[26] http://www.moew.government.bg/recent_doc/strateg_plans/2009/MOSV_Strategia.doc
[27] https://iwlearn.net/iw-projects/397

policies on transportation and safe disposal of municipal waste and urban wastewater treatment plants. No significant progresses were reported in curbing unsustainable development trends. Hot spots in the Bulgarian coast refer to industrial activities, pollution due to oil products and wastewaters along the beaches. Shipping as well is considered to be one of the greatest pressures on the environmental coastal quality (Principle 5). The participatory process, involving all the interested parties, is widespread in the coordination activities of local and regional policies. Some examples concern the EIA public discussions, the River Basin Management Plan[28] discussions, the protected areas and Natura 2000 sites assessment of compatibility, etc. (Principle 6). Several examples of public database are available to widespread information on coastal zone, concerning coastal uses, protected land and sea areas, landslide and erosion processes. Little progress in the vertical coordination was reported both at national and local level thanks to the inter institutional boards and new development plans (Principle 7). In recent years the coordination mechanism was improved in Bulgaria, even if the importance to coordinate ICZM activities with other sectoral policies is still underestimated (Principle 8). The need for a better inter-institutional coordination in order to develop common actions to reinforce coastal area is furthermore highlighted.

Status of MSP in Bulgaria: National maritime spatial plan draft has been prepared and was approved at the end of 2020 by the Ministry of Regional Development and Public Works (the Competent Authority). The draft plan and its EIA have been under public consultation in August 2021 with stakeholders and it is expected the draft plan to be submitted to the Council of Ministers for approval by the end of 2021, and after it is published in the State Gazette, to be submitted to the European Commission.

Planning for Land-Sea Interactions: In Bulgaria the territorial and sea planning do not have a specifically formalised approach to LSI. The national approach to MSP aims at a systems perspective, aware that most uses also can imply LSI aspects. Although the Maritime Spaces, Inland Waterways and Ports Act envisages the consideration of LSI in the MSP, the Act does not provide **a definition of Land-Sea Interactions** and there is still no clarity how the LSI should be taken into account and explored in the planning process. Here, the overlap of national MSP with municipal coastal planning is emphasised as ensuring **a 'planning continuum'.** As many activities have direct or indirect impacts on coastal areas, closer collaboration between MSP Competent Authority (MRDPW) and coastal municipalities (territorial planning) is needed to promote sustainable and ecologically effective uses on land and at sea, especially for those with implications across the land-sea boundary. Even though the coastal municipalities have no mandate and jurisdiction to plan the sea, they plan activities and infrastructure on the shore and beaches, such as piers, marinas, other coast-protection structures etc.

Romania

1. What is the geographical scope of the MSP plan in Romania: it applies to internal waters, territorial waters and EEZ? How far does it apply landward in the coastal zone, does it stop at the coastline?

Romania has transposed the Directive 2014/89/EU since 2016 once with the entry into force of the Government Ordinance no. 18/2016 regarding the maritime spatial planning. In this regard, the maritime spatial planning is the activity consisting in the process of analysis, planning and organizing the human activities in marine waters, in order to meet ecological, economic, social and safety objectives, representing a dimension of the integrated maritime policy of interest to Romania. This cross - sectorial activity allows competent authorities and stakeholders to use a coordinated, integrated and cross - border approach in promoting the sustainable development and growth of maritime and coastal economies. In Romania, the maritime spatial planning applies to the marine waters defined as follows:

[28] https://www.bsbd.org/uk/RBM_mplans.html

a) the waters, the seabed and the seabed located in the outer part of the baseline which is the limit for measuring the extent of territorial waters extending to the extremity of the area where Romania has and / or exercises jurisdiction (including the continental shelf and the exclusive economic zone);

b) coastal waters, their bottom and subsoil.

At the same time, it should be mentioned that in Romania there is no legal definition of Land-Sea interaction (LSI) and at this moment it's not clear how the LSI should be taken into account and explored in the planning process both in relation to MSP and ICZM. At the same time, in Romania, the legislative framework for Integrated Coastal Zone Management has been adopted since 2002.

2. The MSP Competent Authority in Romania is responsible for planning the sea area from the shoreline outwards, whereas the municipalities are responsible for planning onshore?

The competent authorities for maritime spatial planning in Romania are: the competent authority for elaborating and monitoring the implementation of the maritime spatial plan, respectively the Maritime Spatial Planning Committee, with attributions in elaborating and monitoring the implementation of the maritime spatial plan, and the public authorities that are competent for the implementation of the maritime spatial plan.

Through the maritime spatial plan, the competent authorities shall aim to contribute to the sustainable development of the offshore energy, maritime transport, fisheries and aquaculture sectors, as well as to the conservation, protection and improvement of the environment, including the increase of its resilience to the impact of climate change. Among the objectives pursued are the promotion of sustainable tourism and the sustainable extraction of raw materials.

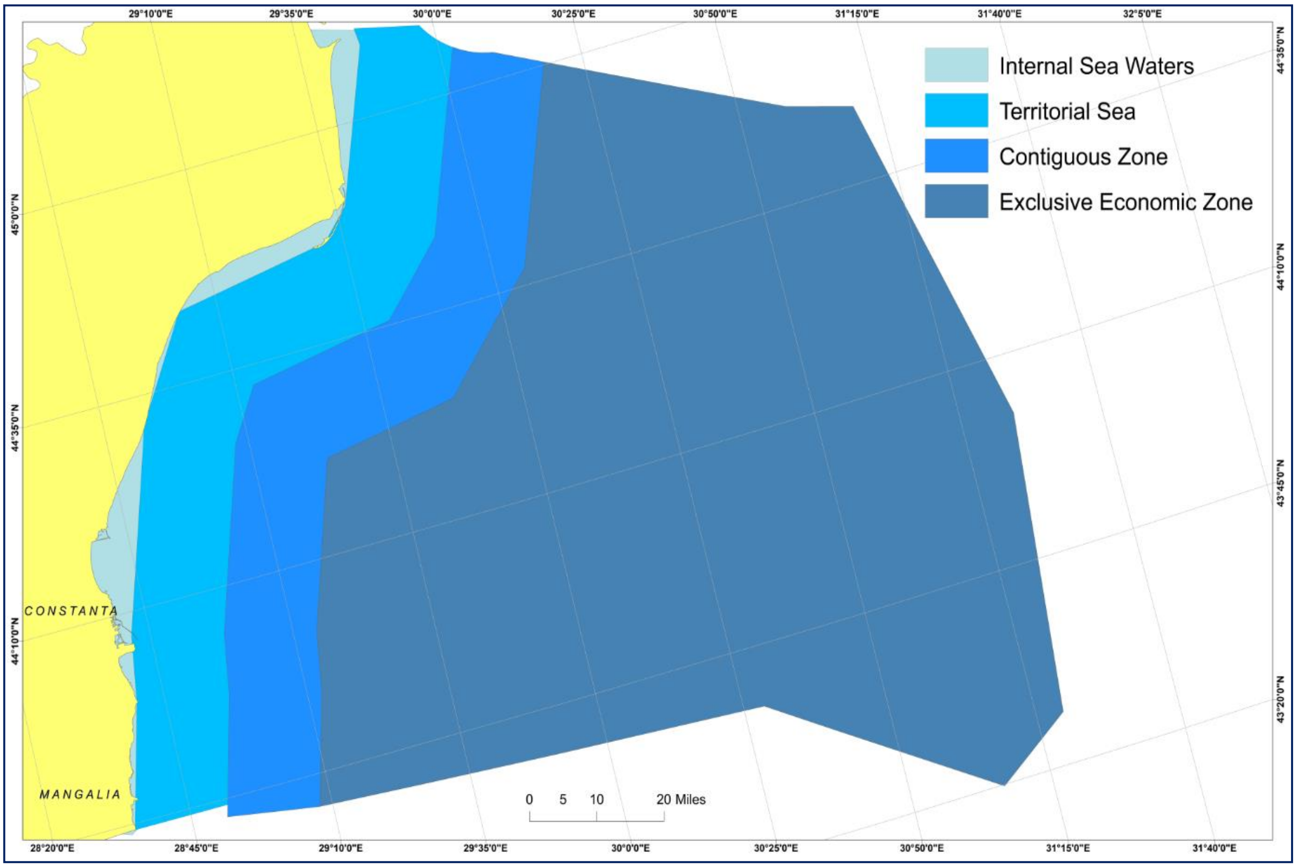


Figure 5 Maritime delimitations and jurisdictions of Romania[29]

[29] The map is an approximate representation of the border between Romania and Bulgaria. The partners of the MARSPLAN-BS II project do not have the quality or the competence to decide or negotiate the border between the two states.

According to the national legislative framework, the maritime spatial plan contributes to strengthening the cooperation between central public authorities and local public authorities, by developing a strategic vision and an integrated management.

Coastal local authorities are members of the National Coastal Committee, therefore they are directly involved in the work on integrated coastal zone management (ICZM), and of course they are involved in the onshore planning. The coastal area is state's public property and is free for bathing and beach, walking, water sports, sport and recreational fishing, navigation, in cases where they do not require works and / or facilities of any kind. At the same time, the use of the coastal area for activities that involve hazards, profit making or that require works and installations are allowed only within the limits of this emergency ordinance or special laws.

The local and the central public authorities for environmental protection and water management may limit or prohibit the movement of the public in the coastal zone, during certain periods or in certain vulnerable areas from the point of view of environmental protection.

3. Does MSP overlaps and complements regional/municipal planning in adjacent territorial and onshore waters? Does the national MSP overlaps with the established municipal onshore and land planning?

The Government Ordinance that transposes the Directive 2014/89/EU does not apply to territorial planning and urban planning activities, as regulated by special national law. Thus, the maritime spatial plan was proposed as complementary to the territorial planning and the integrated coastal zone management.

Maritime spatial plans should contribute to strengthening cooperation between central and local public authorities, by developing a strategic vision and integrated management. At the same time, in the elaboration procedure of the MSP and at the Maritime Spatial Planning Committee meetings, the representatives of the public institutions with attributions in the regulatory fields of MSP will actively participate, among which we can list the local public authorities, as competent authorities for the implementation of the maritime spatial plan.

In this regard, the maritime spatial plan will take into account the land-sea interactions and the integrated coastal zone management that is already regulated.

4. What are the roles/responsibilities and mandates of municipalities in planning coastal zone and onshore waters (in case there is established municipal planning of adjacent onshore waters and this overlaps with MSP, then the Directive does not apply?

Based on the principles stated by the national legislation, for the protection of the coastal zone and the application of its development strategy, the central public authority for environmental protection and water management, in collaboration with the central and local public administration, will develop the integrated coastal zone management plan, which will establish:

a) the guidelines for spatial planning and development of various economic activities and infrastructure, as provided in the spatial planning and urbanism plans;

b) priorities and objectives in accordance with the potential for environmental sustainability in the coastal area;

c) the strategy of protection against degradation by marine erosion and environmental rehabilitation of the coastal area;

d) protected areas from the point of view of environmental protection;

e) the areas necessary for the security of the coastal area.

The elaboration of land use and urban plans will take into account water resources, coastal and marine habitat and real possibilities for recycling and waste storage, protection of vulnerable areas and protection of cliffs against erosion. The land use and urban plans provide access roads to the coastal area, preferably pedestrian or bicycle roads.

Construction permits have a special granting regime, which will be established depending on the geomorphology of the land.

The location of any constructions on lands covered by dunes, swampy lands, caves, and cliffs, lands with forests with special protection functions, other natural habitats near cultural monuments or where they affect the security of the environment is prohibited.

5. Even though the municipalities have no mandate to plan the sea, they plan activities and infrastructure on the shore, such as piers, marinas, docks, and beaches. Some municipalities plan also the adjacent internal waters of port areas and infrastructure and thus overlapping/complements with national MSP?

Considering that in Romania, the coastal zone is regulated in accordance with the legislation in force, the attributions and competences of the central and local public authorities are clearly defined. In this regard, the central public authority for environmental protection and water management has the following attributions and responsibilities:

a) elaborates, together with other institutions, and promotes the national strategy for integrated coastal zone management and action plans for its implementation;

b) initiates the development of the institutional-administrative framework for the parks and reservations in the coastal area;

c) approves the action plans in order to limit polluting emissions from diffuse sources;

d) coordinates and controls the activity of integrated coastal zone management.

The territorial public authorities for environmental protection and the local authorities for water management have the following attributions and responsibilities:

a) organizes the system of integrated surveillance of the coastal zone environment;

b) elaborates the local action plans for the integrated management of the coastal area and follows their application.

The central public authority for environmental protection and water management organises, through the territorial public authorities for environmental protection, information and education actions on the integrated management of coastal areas. The necessary funds for these actions will be provided annually through the budget of the central public authority for environmental protection and water management, as well as from sponsorships.

Within the scope of application of this emergency ordinance, the local public administration has the following attributions and responsibilities:

a) ensures the registration in the urban and spatial plans of the vulnerable areas and of the other areas mentioned in the special law;

b) ensures the maintenance of the cliffs on the coastal area.

In order to ensure the integrated management of the coastal area, in addition to the central public authority for environmental protection and water management, based on the Emergency Ordinance no. 202/2002, the National Committee for the coastal area was established (an inter-institutional body, which includes central and local public authorities, representatives appointed by non-governmental organizations and representatives of research institutes).

Thus, the maritime spatial plan will target new planning activities and will not limit the attributions of the local public administration authorities that they have on the urban and spatial planning and it is expected that the maritime spatial plan will not limit any attribution of another public authority, but to integrate existing uses and identify the spatial and temporal distribution of current and future activities and uses in marine waters and establish the general framework for sustainable and integrated development of different sectors in marine waters.

2.2 Examples of LSI in Bulgaria and Romania

Bulgaria

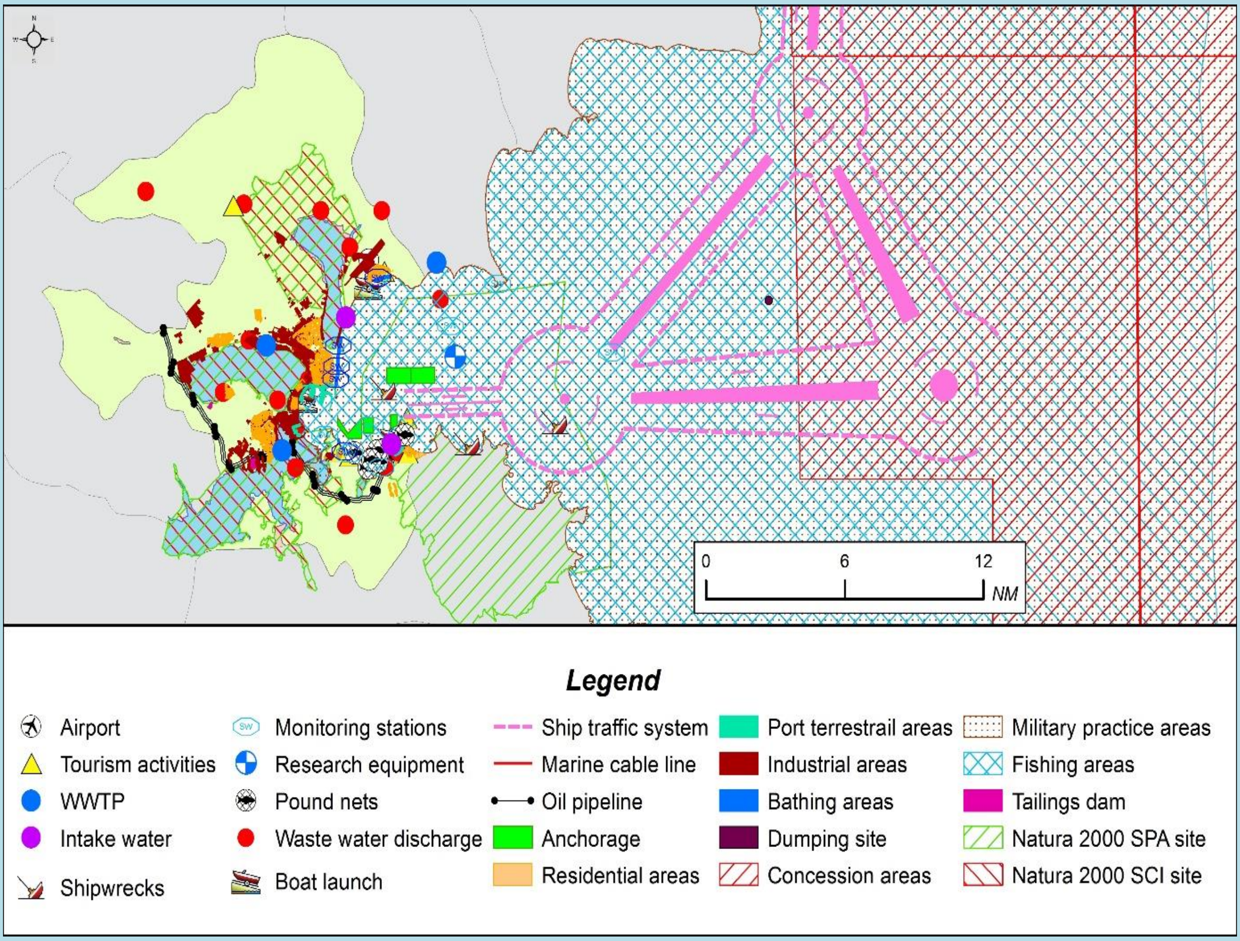
Within the first MARSPLAN-BS project a number of different natural and human-induced LSI were identified based on the pilot case study for Burgas [29]. The highest number of land-sea conflict interactions was indicated for oil pipelines, wastewater discharge and tailing dams (with quality of bathing waters, coastal fishing, intake waters and protected areas). The sea-land conflicts (uses-uses and uses-environment) that were identified mainly include: wastewater discharge in the maritime area has negative impact on coastal tourism, terrestrial protected areas and wetlands; dredging activities have negative impact on coastline morphology, sediment transport and sustainability of sand beaches and dunes as their action is similar to sand mining and extraction; anchorage sites can affect coastal tourism; various types of marine litter from the passing ships and other shipping activities have an adverse impact on beaches and coastal tourism. Marine litter, in particular plastic, is a serious offence to the visual and aesthetic sensitivities of tourists and local visitors to beaches. Solid waste and littering can degrade the physical appearance of the water and shoreline and cause serious damages to marine biota. Sea-land military trainings can also affect coastal tourism, beaches, dunes, wetlands and other terrestrial protected areas, and historical cultural heritage. Potential sea-land conflict interaction would occur due to the oil spill pollution in a marine accident which can cause severe damages not only to marine area, as well as to the coastline: wetlands, beaches, coast-protection structures, rocky cliffs and all ecosystems. Similarly, the coastal tourism industry can be harmed by direct impact of oil spills to beaches and waterfront properties and other infrastructure (see **Box 1**).

Box 1: Burgas Case Study: Land-Sea Interactions [29]

In Burgas Case Study it was aimed to:

- follow the land-sea interactions with a special focus on biodiversity;
- identify the impact of land infrastructure on wetlands and maritime space;
- find out what are the interactions, conflicts and impacts between uses, sectors and interests both terrestrial and marine;
- select key stakeholders and involve them in the process of identifying current and future trends, sector priorities and interests;
- develop and visualise different agenda options, recommendations and solutions for identified case area issues.

Burgas is the fourth largest city in Bulgaria, located at the south coast and is one of the most important ports at the Black Sea with significant infrastructure for supporting the economic activities. In the surroundings of the pilot area there are valuable natural protected areas (Natura 2000) and wetlands, important Ramsar sites, such as: lakes of Atanasovsko, Burgas and Mandra. The necessity of performing case study at the area of Burgas Bay came up as a challenge for sustainable economic development and protection of biodiversity of all wetlands and effective use of natural resources: those are in close proximity of the large city and the existence of various coastal and maritime activities that inevitably have an impact on the environment.



Land and sea uses and natural values in Burgas case study area

2.2.1 Interactions due to natural processes

Interactions due to natural processes involve for example agricultural run-off resulting in eutrophication of coastal waters, or land-based pollution associated with industrial / agricultural activities also affecting the quality of coastal waters. Key LSI issues relating to natural processes for Bulgaria are: coastal erosion (including coastal defence and coastline changes, onshore sea water circulation changes), landslides, extreme storm and flood events (as a result of climate changes and sea level rise), intrusion of salt water into fresh water systems, pollution from landward activities, e.g. the impact on the good environmental status of the marine environment and associated human activities (such as land-based sources of water pollution and marine litter and the subsequent impacts on marine species / habitats, shellfisheries / aquaculture, bathing waters). At the same time, **human activities can interfere with natural processes, for example large number of built solid coastal protection structures (mostly groins, seawalls and dikes/revetments) have intensified coastal erosion in Bulgaria**. The analysis of the expected impacts of land and marine activities should include the evaluation of their effects on LSI natural processes and the potential consequent effects on natural resources and ecosystem services.

- **Coastal erosion, including coastal defence (Sea-Land / Land-Sea)**

Coastal erosion represents a critical LSI for Bulgaria, in particular at some urbanised sites with tourist infrastructure and other urban developments. Beach reduction and cliff retreat, both natural and human-induced, are one of the main hazards affecting the coastline. Flooding in low-lying areas is another hazard, as 20 % (83 km) of the coast is at low enough elevation to be at risk to local storm surges [30]. Cliff erosion is largely controlled by the geological settings of the coast, but is also affected by accelerating sea level rise. Wave attack during elevated water levels accompanying storm surge can cause intense cliff and beach erosion. As a result, a number of large beach areas have experienced continuous reduction of areas [31] and it was found that circa 48 % of sand beaches in Bulgaria have been eroding.

Highest cliff erosion rates occur on those areas of the North Bulgarian Black Sea coast formed of loess, between Capes of Sivriburun and Shabla (0.30 m/y), and those areas formed of clay on the south coast between Pomorie town and Cape Lahna – 0.22 m/y [32]. In solving coastal erosion and landslide issues along the Bulgarian Black Sea coast mostly hard stabilisation structures have been widely used since 1980s, such as solid groins, coastal dikes and seawalls. Based on Very High Resolution ortophoto images from 2010/2011, 402 technogenous (armoured) segments were classified (port/coast-protection structures and artificial beaches) with a total length of 69.89 km by engineering criteria: i) 178 different types of groins; ii) 31 dikes; iii) 26 seawalls; iv) 73 embankments/rip-raps; v) 62 ports, marinas/quay walls and navigational channels; vi) 14 segments, representing artificial beaches. As a result, the armoured/engineered coast occupies 16.2 % (or 70 km) of the Bulgarian coastline [33].

Despite numerous hard protection measures applied so far, erosion and landslide problems have not been solved. Current cliff and beach erosion is associated with these, which have reduced sediment inputs and interrupted sand movement along the coast. In Bulgaria, the main institution involved for coastal protection is Geo-protection and Public Works Directorate at MRDPW, supported by the state consulting company Geo-protection Varna, the latter mainly dealing with monitoring, study and design, implementation and maintenance of coastal protection activities. Land-based interventions such as alteration of river input are also potential drivers of coastal erosion. It was found that coastal erosion over the last few decades has been mainly activated by accelerated anthropogenic impact on the Bulgarian coast in terms of maritime constructions, dredging works and river engineering [32]. As a result, in 1960-2008, the amount of sediments from cliff erosion, river solid discharge and aeolian drift has decreased from 4,979,700 tonnes/year to 1,221,300 tonnes/year. The sporadic natural erosion in the near past has now become critical at many coastal sites. Constant monitoring of cliff and beach erosion at most hot spot erosion areas and modern remote data are needed for sustainable coastal planning and MSP in the future.

On one hand, coastal erosion is hazardous to coastal habitation and public/private properties. Yet, erosion is a natural mechanism by which the coastline adjusts to changing conditions and it provides a sediment supply to the nearshore zone and beaches. The primary response to coastal erosion in most countries is to protect property at the expense of natural processes [34]. Coastal erosion can generate impacts both on marine and coastal environment and on human activities. Alteration of the coastline as construction of coastal infrastructures which act as barrier to sedimentary process, or deterioration of biogenic habitat (e.g. seagrasses) which enhance the deposition of calcareous sediments, are among the main causes of increased loss of sediments on the coastline and consequent coastal erosion. On the other hand, coastal erosion may have negative impacts on natural resources and ecosystem services and loss of habitats, with consequent environmental fragmentation, and loss of biodiversity, as well as of landscaping and environmental heritage. The impact on human activities is mainly on tourism development but it can also affect fishery, transport infrastructure and physical restructuring of coastline.

- Storm and flooding events (Land-Sea / Sea–Land)

Sea level rise, low-laying coasts, coastal erosion, and changing precipitation patterns modify hydrodynamic gradients and may enhance sea–land exchange processes. Flooding events due to strong sea storms as well as to river floods lead to flow of water rich of urban material fragments and waste, sludge and alluvial debris, toxic substances and materials that are discharged in the sea thus impacting the interested coastal areas and the marine environment [3,25].

In contrast to climate change-induced sea level rise, which can be predicted over a middle time scale, the extreme sea level rising associated with storm surges, tsunamis and rain-storms could have a short, but particular devastating impact on coastal areas [30]. Significant coastal changes typically occur during such extreme events, as well as huge disasters, damages of near shore critical infrastructures (harbour, roads, buildings and civil structures), increased human disease and even loss of life. Coastal storms are extreme meteorological events that mainly occur along the Bulgarian Black Sea coast in winter with the severe N and NE winds. Such storms could have devastating effects on the natural environment and coastal infrastructure both on and offshore, but could be dramatic when are combined with additional events like surge waves or heavy rainfalls. There are examples of such events along the Bulgarian coast: the storm in February 1979 accompanied by extreme sea level increase and the storm in June 2006, combined with pour rains. In Bulgaria, according to the requirements of art. 6 of Directive 2007/60/EC[30], Art. 146d and Art. 146e from the Water Act[31], maps of areas at risk and maps of areas at risk of floods should be established. Compilation of maps of areas at risk and maps of areas at risk of floods is a key stage in the implementation of the requirements of the Directive - based on them, a Flood Risk Management Plan was developed, which addresses all aspects of flood risk management, taking into account the characteristics of the specific river basin. The programme of measures focused on prevention, protection, preparedness, including flood forecasts and early warning systems. In result of the conducted analysis and assessments for the Black Sea basin management region (2016-2021), a total of 45 regions with significant potential flood risk have been identified[32]. Of them, 34 contain locations with river floods, and 11 with sea floods (with total length of 267 km).

- Landslides (Land-Sea / Sea-Land)

Landslides along the Bulgarian Black Sea coast amount to 79 and cover 12% of its length (about 45 km) on an area of 37 km^2. They are concentrated mainly in the coastal area of the Danube plain (86% of the length and 97% of the area of all landslides). This is favoured by the slope of the beaches on the Moesian plate which is 3-4° to north-east of the Black Sea trough and the vertical movements of the crust rise at a rate 2-4 mm/y forming high and steep slopes, that develop landslides [35]. The main exogenous processes affecting the landslides along the Bulgarian Black Sea coast are wave action and the impact of surface and ground waters. In recent years the role of anthropogenic factors has also increased (undermining and overloading of slopes, flooding by water supply and sewage networks, dynamic loads), especially in the urban, industrial, resort and vacation home areas along the coast. A number of landslides are located between the Romanian border and Cape Shabla at the North Bulgarian coast. Here the coast is composed of loess with thickness of up to 20 m, below which lies limestone. Typical translational landslides are developed in the limestone that forms the coast between Cape Shabla and Cape Kaliakra. These are the landslides Yaylata and Taukliman located at 1-2 km south of the village of Kamen Bryag. Between Kranevo village and Varna is situated the largest landslide complex on Bulgarian Black Sea coast. It covers the eastern slope of Franga Plateau and its width is increased north-south from 250 m to 4,600 m. Sarmatian limestone lies on clays and clayey marls and slips on them.

Along the south Bulgarian coast landslides occur at Cape Lahna and Sarafovo quarter of Burgas town. At Cape Lahna, Sarmatian limestones and sandy clays slip on Pliocene clays. The landslide

[30] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32007L0060

[31] https://www.lex.bg/laws/ldoc/2134673412

[32] Flood Risk Management Plan of the Black Sea region (2016-2021): https://www.bsbd.org/uk/FR_mplans.html

at Sarafovo is of a circus-shaped type with three step-like strips separated from one another by swampy depressions. Landslide process is activated by wave erosion which reaches rate of 0.5 - 2.5 m/y. The active Sarafovo landslide has destroyed hundreds of acres of farmland and threatened the road Varna - Burgas until the construction of a coastal protection dike in 2002.

The situation along the coast is complicated in particular along the North Bulgarian Black Sea coast by the occurrence of active coastal landslides that have affected coastal and tourist infrastructure near Albena Resort. The main impacts generated by landslide events on natural resources and ecosystem services are the loss of habitats, with consequent environmental fragmentation, and loss of biodiversity, as well as of landscaping and environmental heritage.

- Seismic events (Land-Sea / Sea-Land)

Seismic events can propagate both from land to sea and from sea to land depending whether the epicentre is located on land or on the sea bottom. In general, they can have strong impacts on the coast and a single event can affect both the marine and the terrestrial areas. The impact on human activities is mainly on tourism development but it can also affect transport infrastructure and physical restructuring of coastline [25]. Geological events such as earthquakes, mass movement and landslides may occur and can cause damages to environment and infrastructure. The north coastal region in Bulgaria is subject to active seismicity and the most recent earthquake occurred in the Shabla area [36]. Therefore, possible earthquakes could be considered as a LSI challenge in the coastal zone and in the maritime area.

- Saline intrusion (Sea-Land)

Saline intrusion is one of the increasingly growing LSI issues: it consists in the movement of marine saline water into freshwater aquifers with consequent processes of salinisation of the soil. This process can alter ecosystems and affects coastal organisms provoking habitat and biodiversity loss and community shift. It is the result of the combination of various processes, including exploitation of natural sand deposits in the river mouths, decrease of river water flow in particularly during summer months, hydropower regime, and climate change-induced sea level rise. This interaction has a great impact on the society and economy (coastal tourism and agriculture) by damaging agricultural land and affecting also drinking water sources [25]. Such challenges are sea level rise and possible intrusion of salt water into the coastal fresh/brackish lakes existing in the cross-border area of Bulgaria, such as Durankulak, Shabla and Ezerets. Durankulak Lake protected site is located 15 km north of Shabla Lake and 6 km south of the Romanian-Bulgarian border. The lake has been established as a protected site since 1980. It is also a Natura 2000 SPAs Birds Directive and SCI Habitats Directive and has an area of 446.5 hectares, and is one of the important Ramsar Sites and Important Bird Areas in Europe. Durankulak Lake is a natural freshwater-brackish water lagoon with considerable vegetation cover. It lies in a former river valley, which gives the lake its specific ‘S’ shape. It is surrounded by arable land and steppe territories. Between the lake and the sea lies a strip of sand dunes and beach. The water balance of the lake is determined mainly by groundwater and precipitation.

2.2.2 Interactions due to human activities and uses

Such interactions include for example maritime uses that need support installations on land, also some uses existing mostly on land (e.g., tourism, recreation, ports) expand their activities to the sea as well. These interactions need to be understood, in order to assess their individual and cumulative impacts and potential conflicts and synergies. Generally, land-sea interactions can be measured in terms of: economic significance (employment in maritime sectors), environmental pressures effects of anthropogenic activities on the sea (pollution from pesticides and fertilisers, incidence of invasive species) and flows (goods, including container traffic and liquid energetic products, people, from cruise ships and information, from telecommunication cables) [25].

- **Coastal and maritime tourism/coastal zone over urbanisation (Land-Sea / Sea-Land)**

The significant growth of coastal tourism and particularly the increased number of huge hotels in few large resorts (Golden Sands, Sunny beach) represent a relevant LSI for Bulgaria determined by human activities. Tourism and leisure activities develop in the coastal area both landward and seaward. Tourism, through transit/transport and out-of-home stays, is a significant source of pressure on natural resources and therefore can cause the alteration of the environment and ecosystems of touristic destinations [25].

The fact that coastal population is growing significantly faster than non-coastal population should be of increasing attention and importance for coastal and maritime spatial planners and managers [37]. Bulgarian coast has experienced dramatic alterations over the last decade due to real estate boom and increased impact of new developments, such as huge hotels or second residential homes located on the active beach and dunes. Natural coastal systems are not only impacted by the infrastructure and development of a particular coastal municipality, but the systems are also stressed by the continued, heavy, direct use by the tourists themselves. This pressure varies in intensity among the regions but also at different times of the year. As a whole, adverse impacts of coastal tourism on the Bulgarian coastal zone have resulted from expanded human pressure on limited land area and resources, and the conflicts between tourism development and protection of natural environment. Also, water quality is degraded by pollution and because sewage treatment capacity is exceeded during the peak vacation periods. Finally, tourism and recreational activities are major contributors of beach litter, as coastal cities (including seaside, resort complexes) and undeveloped beaches and river estuaries are the hot spots of marine litter for Bulgaria

Coastal tourism is strongly related to LSI as it depends on the quality of the coastal and marine environment; at the same time, it is a relevant pressure on the same environment it is based on. Rivers input of nutrients and contaminants in the bathing waters negatively interact with tourism activity, while tourism is source of pollution affecting coastal waters. Coastal municipalities in Bulgaria are also subject to major population influxes during peak vacation periods. Coastal population in summer can typically increase 20%, but at some municipalities over 320% [37]. The existing facilities and infrastructure in these most crowded coastal municipalities are unable to meet this additional pressure. These peak periods often overwhelm local treatment capacity resulting in heavy impacts on natural geosystems and natural resources.

The main issue of coastal tourism in Bulgaria which needs to be solved is the conflict between the benefits that tourism provides for the economy of the country as a whole, and its heavy impact on coastal physical environment in terms of urbanisation, beach and dunes destruction, pressure on sensitive areas, production of waste, and on the social environment, in terms of loss of social and cultural identity and values of the local people. Given that the beach is of key interest for the majority of coastal tourists, destinations largely rely on the beauty and availability of natural beaches [37].

Impacts of maritime tourism on the land and interactions with other sea uses. Specifically, yachting and cruising tourism is an increasing threat in the sea linked to environmental impacts i.e. air and water pollution, noise pollution, as well as increasing solid wastes and litter. The consumptive level of each passenger on board is much higher than that of local hosting communities; hence cruise tourism has the potential to overwhelm the regions that they visit. Excessive use of marine space for tourism can lead to a reduction in biodiversity and attractiveness of the area, as well as reduction of overall space capacity. Positive impacts are related with socio-economic development by increasing the number and diversity of jobs, as well as diversification of tourism and complementary activities. Sea makes it possible to develop traditional bathing tourism and is a main reason for tourist arrivals in Bulgaria.

The challenge for recreational boating is to secure adequate space for the development of marinas and access to the waterfront and for safe navigation even during peak seasons. Therefore, conflicts between recreational boating and other uses are linked to overcrowding, space restriction and safety hazards. Boating may compete with other recreational activities (e.g. swimming) or with different type of boating (e.g. sailboats, motorised vessels, personal water crafts, etc.). However, codes of conducts, proper planning and good communication between users can minimise these conflicts. Other potential conflicts are related to areas where boating may not occur due to the presence of other blue sector infrastructures (e.g. aquaculture farms, oil and gas platforms).

On the other hand, there are several positive effects of tourism-driven LSI, mainly related to socio-economic benefits: coastal and maritime tourism is still a key sector for Bulgarian Blue economy, as revealed by the EU Blue Economy Reports in 2020[33] and 2021[34]. Coastal and maritime tourism creates a number of opportunities in the economic field (e.g. increased income for the local population, development of local infrastructure, creation of jobs and new businesses, etc.).

- Fishing (Sea-Land)

Fishing, including small-scale fisheries, has a strong impact on the coastal area and is a key activity in relation to LSI. Fishery uses traditionally have been connected to the land. Areas on the coast have historically been settlement areas due to the proximity of fishing. For the fishing industry, the connection with and access to the sea has always been important for fishing communities, fishing ports and the processing industry. Fishing vessels, that operate at sea, need adequate land-based mooring and facilities for their operability and maintenance, as well as for the processing and commercialisation of the marine products (e.g. warehouse, terrestrial means of transport and connections).

Capture fisheries can reduce fish abundance, spawning potential and, possibly, population parameters (growth, maturation, etc.). They modify age and size structure, sex ratio, genetics and species composition of the target resources, as well as of their associated and dependent species. When poorly controlled, fisheries develop excessive fishing capacity, leading to overfishing, with major ecosystem, social and economic consequences. Fishing gear can change the living and non-living environment within which the target and other related resources live. Environmental damage may come from the very nature of the fishing technology or from the inappropriate use of an otherwise acceptable gear (e.g. using bottom trawls).

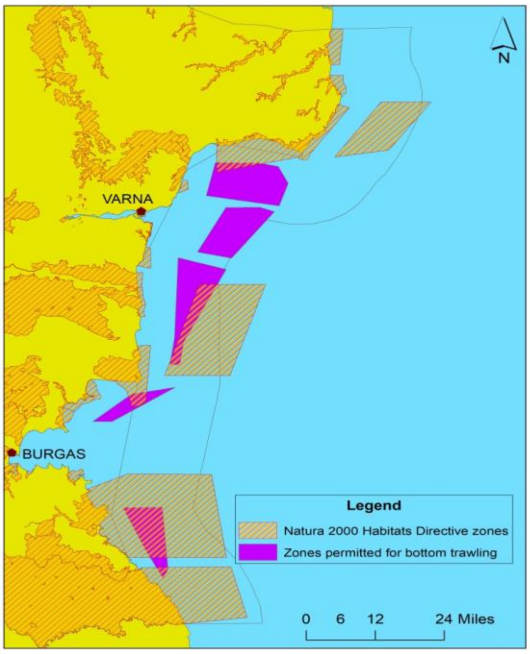


Figure 6 Conflict zones between bottom trawling and MPAs (Natura 2000)
(Data source: EAFA and MOEW, 2020; Map produced by CCMS)

[33] The EU Blue Economy report 2020, https://blueindicators.ec.europa.eu/sites/default/files/2020_06_BlueEconomy-2020-annexes-LD-part1_FINAL-readable-maps.pdf. Coastal tourism in Bulgaria only, generated 80 % of all Blue economy jobs and contributed 69 % to Blue economy GVA in 2018.

[34] European Commission (2021). The EU Blue Economy Report. 2021. Publications Office of the European Union. Luxembourg. https://op.europa.eu/en/publication-detail/-/publication/0b0c5bfd-c737-11eb-a925-01aa75ed71a1.

The impact on the habitats depends on the gear and sediment type. Highly dynamic, soft bottoms may suffer limited damage even when exploited by heavy dredges. On the contrary, stable, hard, and highly structured habitats will be easily damaged. Damage is also related to fishing frequency, gear weight and rigging. Addition of heavy tickler chains to the trawl ground rope increases bottom abrasion and turbidity. Five zones in Bulgarian shelf area have been defined, where bottom trawling is permitted for Rapana. Here there is a conflict between the permit for bottom trawling (which inevitably damages seabed habitat), and Natura 2000 protected zones. Four Natura 2000 SCI areas fall into those five permitted zones for bottom trawling, as the southernmost area is almost entirely located in Natura 2000 SCI area (**Figure 6** above).

- Aquaculture (Sea-Land / Land-Sea)

As of September 2021, a total of 25 aquaculture farms were registered in the Bulgarian Black Sea waters most of which operate as SMEs or micro-enterprises. There are 20 farms for black mussels, one fish cage farm, one farm for oysters, one farm for rainbow trout and three objects (in coastal lakes of Varna and Beloslav) for breeding and extraction of sea worms.

Typically, aquaculture zones exclude other uses, leading to spatial conflicts. Although shellfish farming is in general environmentally neutral, some typologies of aquaculture may lead to habitats damage, spreading of diseases and water pollution. Usually aquaculture facilities are installed in well-protected areas such as estuaries, fjords and heavily incised inland bays. Such places do not exist on the Bulgarian Black Sea coast, which poses the need to use storm-proof equipment in unprotected by wave action areas. This undoubtedly makes the production of mariculture more expensive.

Significant factor with a negative effect on marine aquaculture is anthropogenic pollution, which results in increased eutrophication and the appearance of blooms causing oxygen deficiency in the affected areas along the coast. Building of treatment facilities, prevention of oil spills (products) will allow the development of mariculture in more parts along the Bulgarian Black Sea coast. Aquaculture can represent a significant contribution to the conservation of sensitive environments, reduce the negative impacts of other industrial activities and contribute to the re-constitution of overexploited fish resources and the conservation of cultural heritage.

- Human-induced eutrophication (Land-Sea / Sea-Land)

Substances like nutrients and pollutants enter into the sea from several sources. Human activities can accelerate the rate at which nutrients enter ecosystems. Runoff from agriculture and development, pollution from septic systems and sewers, sewage sludge spreading, and other human-related activities increase the flow of both inorganic nutrients and organic substances into ecosystems. Aquaculture or dumping of dredged material may be also sources of nutrient increase but, in general, they are not as important as the previous ones. Atmospheric deposition also contributes to the entrance of nutrients and heavy metals to the sea. Phosphorus is often regarded as the main culprit in cases of eutrophication subjected to 'point source' pollution from sewage pipes [25]

Human-induced eutrophication typically occurs in coastal waters exposed to nutrient input, especially in enclosed bays, lagoons and harbours where nutrients usually concentrate. The enrichment of nutrients to an ecosystem can result in a massive growth of macroalgae. The existence of such dense algal growth areas can inhibit or prevent access to waterways. This decreases the fitness for use of the water for water sports (swimming, boating and fishing). Eutrophication can cause proliferation of toxic phytoplankton (harmful algal blooms), anoxia (lack of dissolved oxygen in water) and consequent deterioration of bathing water quality and ecosystem health.

The Black Sea is vulnerable to the effects of eutrophication because it is partially closed and has a large catchment area. Eutrophication is one of the main ecological problems in the Bulgarian part of the Black Sea. In 2018, from all 17 coastal water bodies in Bulgaria, 8 have Good Status, 4 water bodies - Moderate, 1 water body is with Bad Ecological Status, and for 4 water bodies the Ecological Status has not been determined[35]. The water body of the Bay of Burgas is characterised as the most critical along the Bulgarian coast, where it has the most tangible local anthropogenic impact. The area is subject to an extended human-induced pressure: biggest cargo port and other smaller ports and harbours, including fishing ports, pollutions from industry, pollutions from small rivers, etc.

In the summer season, a key role is played by local factors (nutrient and organic input), related to the condition of wastewater treatment plants and inflow from other land-based sources, in conditions of increased influence and extreme natural factors such as high summer temperatures, increasing storm intensity, cycle changes and rainfall intensity characteristic.

In accordance with the requirements of Marine Strategy Framework Directive (MSFD[36]) the direct and indirect impacts of eutrophication are determined (Initial Assessment), distinguishing between those on the water column (planktonic communities) and on the seabed (benthic communities).

Direct effects:

- changes in the transparency and concentration of chlorophyll-*a* in the water column;

- changes in the ratio of dominant species (e.g. diatoms to dinoflagellates);

- flowering of toxic species;

- changes in the number/abundance of opportunistic macroalgae and other species;

- mortality of demersal organisms, etc.

Indirect effects:

- changes in species composition and food chains;

- oxygen regime and others.

- Substances, marine litter (Land-Sea/Sea-Land)

Marine litter is usually defined as any persistent, manufactured or processed solid material discarded, disposed of, or abandoned in the marine and coastal environment.[37] Marine litter is a main issue with severe impacts on terrestrial and marine environment. The land sources of litter are coastal towns, ports, bathing areas, landfills of urban solid waste and rivers. The marine sources come mainly from fishing and navigation activities. In both cases, the litter can be produced by the crew (lost or thrown overboard), and in the case of fishing, it can also come from abandoned gears, causing what is known as 'ghost fishing' [25]

Recent study reveals significant costs of marine litter impacts on tourism and recreation, shipping and yachting, fisheries, and aquaculture, particularly in the form of time and money wasted in cleaning marine litter from their nets, farms, etc. (EC, 2019)[38]. Significant economic costs are associated with potential future degradation of the ecosystems, reduction of food production, human health issues and the ongoing 'global warming', which is also affected by aging plastic releasing trace gasses that contribute to the greenhouse effect.

Marine litter in the Black Sea originates almost completely from solid waste pollution- various land- and sea-based sources as a result of manifold human activities and, evidently, causes multivectorial negative impact on the population, wild life, abiotic nature and some sectors of economy (e.g., tourism, fishery and marine traffic). Marine litter pollution affects public health and poses a major threat to the Black Sea marine environment, as well as to the

[35] The Black Sea Basin Directorate annual report for 2018 shows trends of the changing ecological status of the Bulgarian coastal waters, for more information follow the link: https://www.bsbd.org/UserFiles/File/annual%20reports/Doklad_2018.pdf

[36] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056

[37] http://publications.europa.eu/resource/cellar/2f418eca-0303-11e7-8a35-01aa75ed71a1.0001.03/DOC_1

[38] European Commission. 2019. The EU Blue Economy Report. 2019. Publications Office of the European Union. Luxembourg. https://op.europa.eu/en/publication-detail/-/publication/676bbd4a-7dd9-11e9-9f05-01aa75ed71a1/language-en/

sustainable development of the region. Its impacts include entanglement and ingestion by animals, habitat degradation and exposure to certain chemicals.

Recently published study on beach litter in Bulgaria, exhibited that the beaches along the Bulgarian Black Sea coast were highly polluted [38]. The most significant levels of pollution are artificial polymer materials - 84.3%. Dominant in this category, including 92 types were the cigarette butts and filters (OSPAR-code 64), followed by plastic caps/lids of beverages - (OSPAR-code 15) and plastic cups and cup lids - (OSPAR-code 21). The seasonal fluctuations for the most marine litter showed highest quantities during the summer period (tourists pick) compared with the rest of the seasons.

The main sources for waste accumulation on the Bulgarian Black Sea coast and their entry into the marine environment are:[39]

- Unregulated landfills, sewerage networks from coastal settlements and other urbanized areas;
- Tourism and recreational activities in the coastal zone;
- Construction activities (from resorts, residential and seasonal constructions);
- River runoff, including rivers flowing directly or indirectly into the Black Sea and through ravines;
- Surface runoff, through open drainage channels;
- Commercial and recreational fishing and aquaculture facilities (including lost and abandoned fishing nets and gear or parts thereof);
- Transboundary shipment of solid waste (some of the waste found on the northernmost beaches).

Excess nutrients originate from fertilisers, fossil fuel burning, and wastewater from humans, livestock, aquaculture and industry, leading to air, water, soil and marine pollution. Wastewater has a direct impact on the biological diversity of aquatic ecosystems, disrupting the fundamental integrity of the life support systems on which a wide range of Blue economy sectors depend - from coastal and marine tourism to fishery and aquaculture. Much less influence is made by local inflows from industrial pollutants, agricultural activities and untreated domestic wastewater. This influence is mainly in coastal sea waters. The water body of the Bay of Burgas is characterized as the most critical along the Bulgarian coast, where it has the most tangible local anthropogenic impact. The area is subject to an extended human-induced pressure: biggest cargo port and other smaller ports and harbours, including fishing ports, pollutions from industry, pollutions from small rivers, etc. Along the coast, there are 105 industrial sites in the basin area, 77 of which have been identified as significant sources of wastewater[40].

For decreasing the diffuse pollution sources, Bulgaria provides a system of measures, aiming full implementation of Directive 91/676/EEC[41] concerning the protection of waters against pollution caused by nitrates from agricultural sources. Although significant pollution of the surface waters and significant level of eutrophication have not been ascertained on the national territory, the implementation Programme under the Directive provides concrete measures for the prevention and the reduction of the surface waters' pollution from agricultural sources. The Black Sea Coast Development Act establishes two types of protection zones (up to 2.1 km from the sea coast and alongside the whole Bulgarian coast's length) where the use of unregistered mineral fertilisers and plant protection products is forbidden.

[39] https://www.bsbd.org/news/basejnov_savet/BS_33_05_12_19.zip

[40] https://www.bsbd.org/UserFiles/File/PURB/2016_2021/R2/Раздел 2.pdf; in "River basin management plan in the Black Sea region for basin water management (2016-2021)" https://www.bsbd.org/UserFiles/File/annual%20reports/Doklad_2018.pdf https://www.bsbd.org/UserFiles/File/PURB/2016_2021/R2/%D0%A0%D0%B0%D0%B7%D0%B4%D0%B5%D0%BB%202.pdf

[41] https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A31991L0676

In addition to the International Convention for the Prevention of Pollution from Ships (MARPOL)[42], adopted in 1973, the MSFD is the first EU legal instrument to address explicitly marine litter.[43] Assessment of the status, target setting, monitoring, reporting and implementation of measures related to marine litter and microlitter are carried out in accordance with relevant MSFD provisions and have been further specified within a Commission Decision (2017/848/EU)[44]. The MSFD lays the foundation for integrated marine environmental management. This includes integrated management of the types of pressures, as the introduction of waste and its impact on the individual components of the marine environment.

Descriptor 10 (Marine litter) of the monitoring programme in Bulgaria will monitor the quality (different categories and subcategories) and the quantity (weight and/or number of different categories such as: artificial polymer waste, rubber, clothing and textiles, paper and cardboard, treated wood, metal, glass and ceramics, and the total weight and/or number of all waste collected from a specific place) of macrowaste and microwaste on the beach/coastlines along the Bulgarian coast of Black Sea, floating on the sea surface, deposited on the seabed and in the biota (gastric contents of fish, food tract of marine mammals and birds).

This monitoring programme will provide information on the driving forces (tourism, urbanisation, ports, shipping, commercial and recreational fishing and quantitative information on the pressures of waste in the marine environment and the impacts on beaches, sea surface and bottom from waste accumulation, waste), resulting in habitat loss, loss of biodiversity, injured and / or dead marine mammals and birds due to entanglement in nets, ingestion of waste and / or their decomposition into mammals and birds.

- **Farming, livestock farming and industry (Land-Sea)**

The presence of agricultural nutrients (nitrogen and phosphorus) and industrial pollutants is a main cause of eutrophication of surface waters, river and lake waters, as well as marine areas close to shoreline [25]. Nutrients come from a variety of different sources: they can occur naturally as a result of weathering of rocks and soil in the watershed and from the sea due to mixing of water currents. Human-related inputs nutrients, related to people living in the coastal zone, are much greater than natural inputs. In the Black Sea region among the pollution sources causing eutrophication is also Danube River[45].

Due to the increasing coastal population, there are more nutrients entering coastal waters from wastewater treatment facilities, runoff from land in urban areas during rains, and from farming. All these factors can lead to increased nutrient pollution.

Urbanisation and agricultural changes starting in the 1950s have led to pollution from excessive nutrients (i.e. nutrient enrichment, mainly with compounds of nitrogen and phosphorus). Nutrient enrichment by nitrogen, phosphorus and sometimes organic matter can result in a series of undesirable effects. Wastewater is a major source of pollution in Bulgaria that has a direct impact on the biological diversity of aquatic ecosystems, disrupting the fundamental integrity of the life support systems on which a wide range of blue economy sectors depend—from coastal and marine tourism to fishery and aquaculture. The reduction in ecosystem health leads to a decreased quality of ecosystem services, and respectively has negative effect on blue economy sectors such as fisheries, aquaculture and recreation. Inputs of nutrients leading to nutrient enrichment and eutrophication are recognised by the Black Sea Convention as one of the major threats to the marine environment in the Strategic Action Plan

[42] https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx

[43] https://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/index_en.htm

[44] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017D0848

[45] Black Sea region briefing - The European environment — state and outlook 2015 - https://www.eea.europa.eu/soer/2015/countries/black-sea

for the Rehabilitation and Protection of the Black Sea[46].

- **Telecommunication (Sea-Land)**

Currently 99% of the data traffic that is crossing oceans and seas is carried by undersea cables. Several submarine cables pass through the Bulgarian part of the Black Sea (**Figure 7**):

1. KAFOS: Mangalia (Romania) - Varna (Bulgaria) - Rumeli-Igneada (Turkey) - 504 km;

2. Caucasus Cable System: Balchik (Bulgaria) - Poti (Georgia) - 1,182 km km;

3. Black Sea Fiber Optical Cable System (BSFOCS): Varna (Bulgaria) - Odessa (Ukraine) - Novorossyisk (Russia) is a 1,300 km submarine telecommunication, went into operation in September 2001, with a total capacity of 20 Gbit/sec along 2 fiber pairs;

4. ITUR: Italy - Turkey - Ukraine – Russia.

Telecommunication facilities, in particular underwater cables have the potential to give rise to a range of LSI (both negative and positive), including[47]:

- Potentially harmful environmental LSI in the construction phase, such as the disturbance of seabed morphology when laying cables, the re-suspension of sediment, possible pollution releases and noise from construction vessels;
- Effects of disturbance on marine, coastal and terrestrial habitats;
- Potentially harmful environmental LSI arising from terrestrial cable landfalls and routes affecting landscapes and habitats;
- Potentially negative socio-economic LSI if fishing activity is displaced, either in the construction or in the operation phase;
- Positive socio-economic benefits associated with local income and employment (especially in construction phase);
- Technical LSI associated with efficiency of connection to national telecommunication networks.

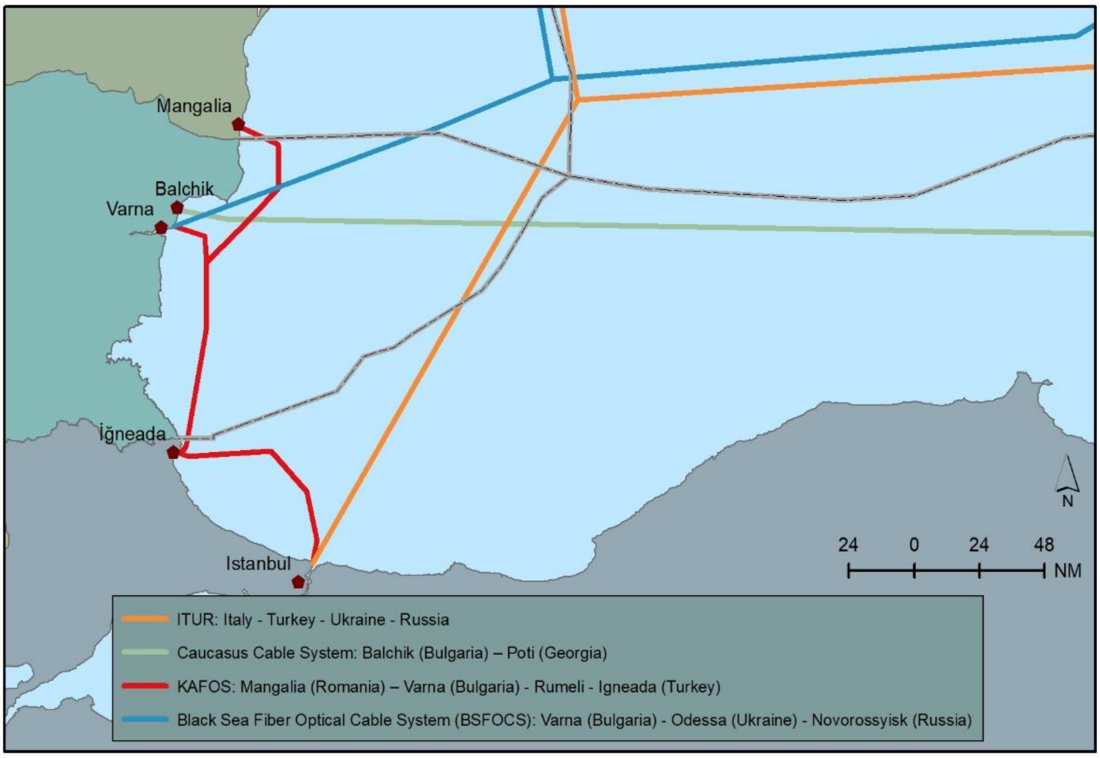


Figure 7 Telecommunication cable network in Black Sea (*Map produced by CCMS)*

[46] http://www.blacksea-commission.org/_bssap1996.asp
[47] https://ec.europa.eu/environment/iczm/pdf/LSI_FINAL20180417_digital.pdf

- Shipping and ports (Sea-Land / Land-Sea)

Maritime transport has a strong impact at the interface between land and sea. Many activities taking place on land depend on the transference of people and goods through the sea, and on proper structures and facilities that ensure such dynamics (e.g. ports, warehouses, passenger terminals, connective roads and railways) [25]. A major environmental impact of the transport sector is represented by the potential accidents and the consequent oil spills. Other pressures on the environment are linked to acoustic and chemical pollution, risk of collision between ships and marine mammals and the introduction of alien species as a consequence of the discharge of ballast waters.

Ports and shipping have the potential to give rise to a range of negative LSI, including:

• Environmental LSI include impacts on habitats and species associated with port developments and canal dredging activities;

• Environmental LSI include modification of hydrographic conditions, underwater noise, increased risk of collision (e.g. by mammals), increased risk of accidents, pollution marine litter and the introduction of non-indigenous species by vessels;

• Maintenance or development of port infrastructure (e.g. widening, deepening) of approach navigational canals, turning circles, berths and/or landside infrastructure (e.g. piers, sea flood defences) has the potential to affect physical processes (sediment transport, waves and currents), which may lead to changes in local coastal processes and morphological alterations of the coastline;

• Environmental LSI include impacts related to poor air quality, airborne noise and traffic, greenhouse gases caused by emissions from shipping vessels and other port-related activities contributed to global warming and climate change (creating green shipping and green ports is one of the EU targets by policy regulations, also adopted mandatory measures and strategy by International Maritime Organisation - IMO[48]);

• Port operations can cause a range of environmental impacts affecting water and air quality, noise, traffic and the disposal of solid waste.

The development of port infrastructure often results in the increase of armouring (concrete, asphalt) leading to degradation of natural coastline and all related marine and land ecosystems. While having those adverse impacts, **there are also positive effects of developing port infrastructures related to the traffic and maritime activities (fisheries).**

- Extraction of non-living resources: extraction of water (Land-Sea)

In general, sea water uses are located on land areas along the coast, from where they are directly connected to the sea by underwater pipes. In some of the water uses, the effect on the marine environment is minimal. This is the case with sea salt production. Sea water from Bulgarian Black Sea is pumped into Atanasovsko and Pomorie Lakes at the south part of Bulgarian coast. The water is placed in shallow lake pools, where the evaporation of sea water produces sea salt. The effect is similar when using water for firefighting purposes. In case of fire and in a situation related to the inability to supply water from a freshwater source to meet water needs. In this case it is a question of preventive provision of a source of water in critical need, i.e. there is no constant use of sea water. In other uses of sea water, negative effects on the environment are possible. For example, in the production and processing of aquaculture, abstraction of sea water for spas in tourist sites, as well as for the needs of the dolphinarium in Varna. There are no data on the studies, related to the quality of wastewater and chemical agents discharged in the sea, and that may affect the

[48] IMO has adopted mandatory measures to reduce emissions of greenhouse gases from international shipping, under IMO's pollution prevention treaty (MARPOL) - the Energy Efficiency Design Index (EEDI) mandatory for new ships, and the Ship Energy Efficiency Management Plan (SEEMP). In 2018, IMO adopted an initial IMO strategy on reduction of GHG emissions from ships, setting out a vision which confirms IMO's commitment to reducing GHG emissions from international shipping and to phasing them out as soon as possible

quality and vitality of the marine environment. An environmental assessment is needed to identify any potential impacts and to take appropriate mitigation actions.

Romania

In Romania also, under the first MARSPLAN-BS project a number of different natural and human-induced LSI were identified in the pilot case study for Eforie[49] which was focused to coastal erosion, but were equally identified coastal and maritime activities, including their double influence in both senses. The SWOT analysis was elaborated and significant number of land-sea conflict interactions was indicated for wastewater discharge and tailing dams (with quality of bathing waters, coastal fishing, intake waters and protected areas). The sea-land conflicts (uses-uses and uses-environment) that were identified mainly included: wastewater discharge in the maritime area has negative impact on coastal tourism, terrestrial protected areas; dredging activities have negative impact on coastline morphology, sediment transport and sustainability of sand beaches and dunes as their action is similar to sand mining and extraction; anchorage sites can affect coastal tourism; various types of marine litter and solid waste from beaches and small motor boats in passing have an adverse impact on beaches and coastal maritime tourism.

2.2.3 Interactions due to natural processes

The main existing threats in the Romanian coastal area in connection with the key issues of land-sea interactions are:

1. Coastal erosion of beaches and coastal cordons (including coastal protection and development and shoreline changes, determined by hydrographic changes related to the coastal area)

2. Erosion of cliffs - extreme sea storms and floods from the territory (caused by climate change and sea level rise)

3. Pollution caused by coastal terrestrial activities, such as tourism, expansion of coastal residential areas, extractive industries, coastal maritime navigation, which produce diffuse, and/or point sources, terrestrial water pollution and the release of marine waste, with negative impact on marine habitats / marine and coastal ecosystems.

At the same time, as an inverse interaction, there are anthropogenic activities, which induce changes in marine / coastal natural processes, regarding the offshore deviation of sedimentary charge transported by the Danube river, redirection or stopping the sediment transport / coastal drift through navigation constructions and / or coastal protection with an impact on biotic and abiotic natural resources and coastal ecosystem services.

- **Coastal erosion of cliffs, beaches and coastal cordons** (including coastal protection and shoreline changes and development, caused by hydrographic changes in the coastal zone), **(Land-Sea)**

Coastal erosion is a critical land-sea/ LSI interaction in Romania, given the magnitude of investments in coastal protection and planning, especially in some priority urbanized areas with tourist infrastructure and other urban industrial, civil and military developments.

The Romanian coast, 244 km long (between the Musura branch and Vama Veche), represents 6% of the total length of the Black Sea coast. Its relief consists of shores with low altitude - beaches (approx. 80%) and cliffs (approx. 20%). From a typological point of view, it includes both natural shore (beaches and cliffs - approx. 84%) and 'built' shore, approx. 16% (ports, hydrotechnical protection constructions).

The northern sector (Musura - Midia) with deltas, lagoons and estuaries consists of river sediments and marine accumulations, recent

[49] http://www.marsplan.ro/en/results/case-study/433-eforie-nord-eforie-sud-area.html

biogenic sands, in the form of beaches and coastal cordons with heights usually less than 2.0 m, being a very exposed shore, impacted by extreme storms. The complex analyzes to evaluate the changes effects of the natural and anthropic factors in their interaction, as well as to underline the coastal protection facilities elaborated in the last years, highlighted that the erosion phenomenon extended on approx. 60-70% of the shore length. In Danube Delta Biosphere Reserve, the beach area has decreased in the last 55 years by over 2,500 ha (approx. 80 ha / year), and the natural sediment contribution was 1/10 (approx. 7 ha / year). The shoreline retreated on variable distances from one shore sector to another, and the maximum value of changes, in some sections of the beach, exceeded 500 m (Câsla Vădana sector). During strong storms, the sea completely covers the coastal areas with the reduced littoral belts, affecting especially the ecosystem of the Razim - Sinoe lake complex, as well as the Sahalin marine lagoon, by periodically breaking the island barrier represented by the coastal peninsula of Sahalin.

The southern sector of the Romanian coast (Midia - Vama Veche) presents structural and morphological characteristics of relief different from the characteristic of the north sector of Cape Midia. The alveolar shore, with beaches and cliffs (mostly active, whose heights reach about 35 m) is largely destroyed by marine abrasion, which has an irreversible character.

The beaches, formed at their base, are relatively stable and have much smaller dimensions. Also, narrow beaches were formed near the old mouths of rivers (Techirghiol, Costinesti, Tatlageac riverbanks) or in front of old bays (marine lagoons Tasaul, Siutghiol / Mamaia beach, Comorova, Iezerul Mangaliei). Due to the geological structure, especially the hard substrate of the limestone platform, as well as the hydrometeorological conditions specific to the area, the coast has undergone intense changes in some sectors as follows: Eforie Sud beach, Neptune beach and Venus/Saturn beach have retreated more than 30-50 m, requiring arrangements and extension of hydrotechnical protection constructions;

In the last 55 years, these arrangements, although not having a major effect, have contributed to the relative stabilization of the coast. The implementation of this protection system began between 1936 and 1940 and then continued gradually, in stages of development (in 1956 - 1960, 1967 - 1970, 1981 - 1985 and 1989 - 1990), until 1991, when this activity was practically stopped, and subsequently restarted in 2013-2015, being currently in a new phase of expansion, on the entire southern Romanian coast.

In 2011, due to the extension of the Coastal Protection Master Plan coordinated by Halcrow / UK company, to a preliminary investigation carried out by N.I.M.R.D. Constanta, it was found that approx. 55% of the hydrotechnical coastal protection system is in a medium and advanced state of degradation. Between 1962/81 and 2011, the erosive effect was predominant (about 76% of the land was affected), which reflects that the protection solutions have only partially achieved their original purpose, resulting the necessity to adjust and expand them in nowadays. Thus, based on the coastal protections inventory carried out at that time (2011), the performances (efficiency) of coastal protection structures were evaluated, in order to identify specific deficiencies of the design methodology and efficiency of executed projects, determining the level of performance both functionally, as well as the stability to the action of marine agitation factors, as well as their economic, aesthetic and environmental impact aspect. On the built shore, although it is a natural phenomenon complementary to the sediment accumulation phenomenon, coastal erosion is considered a dangerous hazard, induced by marine factors influencing the coastal environment, and consequently on heritage / settlements / human activities.

On the other hand, in the natural sectors, without anthropogenic arrangements, coastal erosion has a negative impact on natural resources and ecosystem services, through the loss of habitats, and consequently through the temporary loss of biodiversity. The changes in these areas are constantly in progress, having a higher magnitude than the changes on the built shore, designed for tourism but having an impact on fishing, transport infrastructure, in critical areas of coastal vulnerability.

- Thunderstorms and floods from the territory, occurring at exceptional periods of recurrence (Land-Sea / Sea-Land)

Sea level rise and atypical intensifications, with extremes located in the coastal fronts regarding the change of hydrodynamic gradients can cause the intensification of the processes at the land-sea interface, respectively, the intensification of maritime-terrestrial processes in case of certain extreme events due to precipitation and / or exceptional sea storms.

Romania's climatic peculiarities, determined by the geographical position in the Eurasian context of margin sea, relative to the ocean, are characterized by a strong annual cycle, specific to the temperate-continental area, for which the influence of the semi-closed sea basin is intensely felt both meteorologically and hydrodynamically, causing changes in the roughness of the underlying surface. In the new marine meteorological conditions induced by climate change, there is considerable variability, as well as a high degree of instability, both in direction and intensity. Associated with the wind regime is the marine hydrological regime, of the waves and marine currents, which in the coastal marine area is the main modeler of the shore.

Thus, an important characteristic of strong winds, whose speeds exceed 10m/s, in the area of the Romanian Black Sea coast is the sea storms, whose direction of maximum occurrence is the NE direction and whose duration can reach an average of 107 hours, of which about 47 hours with maximum average speeds of over 28m/s (Bondar, 2001), and gust speeds exceeding 55m/s. The exposure of the Romanian shore to the incident waves with a certain obliquity in relation to the normal to the general direction of the shoreline, can be a classification criterion determined by the development of the northern or southern coastal drift. Even, the frequency of storm surges in the Western Black Sea is lower, it can cause great damage on coast, associated with a sea level rise magnitude of 7-8 times greater than the normal sea level variations, due to other factors. Thus, the storm surges on the Western coast of the Black Sea area can induced to the coastal sea levels increase, with up to 1.3 m, above the mean sea level.

Overall, the Romanian coast can be classified into three categories according to the direction of exposure to sea waves, respectively in relation to the wave front direction. The three categories and the classification of the coast after them are presented as follows:

- general orientation N - S: Sulina - Sf. Gheorghe, Midia - Vama Veche;

- general orientation ENE - VSV: Ciotica - Periteasca;

- general orientation NE - SW: Periteasca - Vadu.

Depending on the fetch and the shore exposure, storms can have devastating effects on the natural environment and coastal infrastructure, and can even exceed estimates of maximum values at multiannual recurrence periods (100-200 years) combined with the hydrological regime of the Danube, or other phenomena, such as atmospheric tsunamis, insufficiently studied in the Black Sea.

Although there are currently no maps of risk areas and maps of storms risk areas, certain vulnerable areas of the Romanian coastal zone, for which certain coastal protection measures have been adopted on the southern coast are more or less integrated at the sectoral level, both for the tourist beaches and for maintaining the integrity of the cliffs.

Following the analysis and evaluations performed for the Romanian coastal area, a total of 12 areas with a major risk of impact of exceptional storms were identified in correlation with / and without the hydrological regime of the Danube, and 5 locations vulnerable to floods / flood hydrological risk determined by massive rainfall in the coastal area.

- Landslides (Land-Sea / Sea–Land)

Landslides occurrences along the cliffs area of the Romania Black Sea coast, encompassing almost 30 km shore length, are concentrated mainly in the southern shore unit. Although the overall state of the coastal cliffs is relatively stable due to a large slope stabilization works together with high shore defense works on 20km shorelenght, still there are several sites on the Romanian shore with active landslides.

Considering the limits of geomorphological retreat due to continuous cliffs' collapse, produced by annual episodic precipitations, given the particularity and irreversible nature of high shore changes in the absence of landscaping and under the combined action of natural factors, represented by the action of marine agitation, hydrodynamic entrainment through rainfall and groundwater infiltration, the rates of change in this area are negative, existent yearly between 0.1-0.5 m. The exceptional events (generated by the anthropic factor) in several areas, including the Costinesti, Olimp and 2 Mai, shore-sectors, affect the rather fragile natural balance in the coastal marine area, given the evolution of coastal habitats in recent years, in relation with dropping of the integrity of the cliffs landscape.

The equilibrium of groundwater's level at the littoral zone is stable now, and its unbalanced situation from 80's produced by the intense irrigation having as source the Danube-Black Sea channel's finishing and putting in use, it is not anymore affecting the landslides in the coastal area of Tuzla sub-sector.

Very few cliffs' areas maintain seepage faces close in shore areas, but certain areas with low layer of Sarmatian limestone, under the sea-level give strong landslide process under the wave attack, reaching an erosion with high rates of 0.5 - 1.5 m/year.

The coastal scenery is affected in particular by coastal settlements or touristic facilities along all the southern shore sector, nevertheless near Olimp Resort, this anthropic pressure brought to this area a severe losing of the landscape heritage.

- Seismic events (Land-Sea / Sea-Land)

Seismic events propagate from the sea were considered within several projects, but in general the tsunami waves are far from affecting the marine and coastal area, due to the wide shelf of Romania, lowering the possible impact on human activities in the vicinity of the coastline. Despite its effects the coastal/inland environment, a tsunami is a rare if not impossible event due to a extremely wide shelf and the placement of the continental margin in the Romanian sector of the western Black Sea Basin, at around 200km seaward, which can dissipate the impact of a long-wave through breaking far from the shoreline.

- Saline intrusion (Sea-Land)

Saline intrusion as a LSI issues, exist in a single area on the Romanian coast, in relation with a transformation of coastal lake in small touristic port. This is the case of Costinesti Lake which in a large scheme of defence against the flash floods produced in summer times was transformed and the sand belt separating the lake from the sea was interrupted by two jetties as defending groins of a rapid discharge channel. In the mentioned organisation, the coastal aquifers were affected and the saline water was felt in the wells from Costinesti, with consequent processes of salinization of the soils.

A similar event was produced when sand nourishment was executed in 80's in the southern sector of Mamaia beach/Resort, when the borrowing source was chosen the sediments of the Southghiol lake bottom. During this operation the water balance through barrier island of Mamaia was unbalanced and some saline changes were felt during the execution phase in a water spring o Cismea, the main water source of Constanta city.

In present no major intrusion of salt water into the coastal aquifer or fresh/brackish costal lakes existent on the Romanian shore were produced.

2.2.4 Interactions due to human activities and uses

Coastal and maritime tourism/coastal zone over urbanisation (Land-Sea and Sea-Land) is in the present times the biggest challenges of ICZM, in translation to a coastal threat on Romanian coast. The barrier island/sand belt of Mamaia was transformed 99% in a settlement area for mass tourism and habitation. Not even 1% was maintained to preserve its specificity as wetland, strongly related to natural LSI and landmark of the quality of the coastal and marine environment. Same processes were done in high shore of southern units in alignment with all coastal resorts due to huge investment pressure on coastal environment.

- Fishing (Sea-Land)

Fishing is considered as an intensively present activity in the Romanian marine coastal areas, due to its strong economic priority, often properly regulated. Its ecological impact on the water-mass of the coastal area is large, since fishing vessels operate at sea both inshore and offshore and frequently abandon gears tools with severe continuous damage on marine ecosystems (ghost fishing). It is necessary to be mentioned the most of this kind of fishing tools come from foreign vessels which illegally enter in the Romanian waters and abandon them when and where they are discovered and pursued by the border police.

Also, marine fishing procurement within small industrial fishing efforts, determined by social preferences, it is impacted directly by marine weather/wave's regime and associated marine ecology and hydrodynamics at sub-mezoscale, including Danube river's fresh water fronts. The professional and recreational fishing at sea, river and lagoon afferent to the Danube delta coast, were qualified according its degree of seasonality on a corridor of river-influenced fish migrations, thus emphasizing the importance of fishing for the economy of the coastal community, despite its impact as source of litter that is discharged in the coastal environment in close areas of protected natural areas.

The fishing and fisheries were the most affected sector by dramatic changes of the western Black Sea ecosystem. On the other hand, the fishing activities contribute to deteriorating the marine and coastal ecological situation and for depletion of the fish stocks through its open access to resource management, overfishing or illegal fishing, and the use of destructive harvest techniques, as well. The structure of the fish fauna, determined through active net fishing, stationary (trap net) and artisan fishing reveals a strong diminution of the biodiversity of fish stocks, existing a high rate of threatening for many species especially in the coastal area of the Danube Delta.

- Aquaculture (Sea-Land / Land-Sea)

The mariculture concerns around the Romanian Black Sea areas have been focusing mainly on fin fish species of high economic value, such as turbot and sturgeons (on coastal farms using marine water), and in recent years, on mussels (on long-line installation submerged in marine water and the Rapa whelk (Rapana venosa) is so spread at the Romanian coast that it becomes subject of studies, marketing and processing.

Thus, currently shellfish aquaculture is far from developed to its full potential in the Romanian Black Sea coastal region due to geomorphological features and hydrological conditions: the sea exposure, respectively the environmental constraints, and due to the deficiency of legislative framework. As result, in Romania, mussel culture is little developed, reaching 15t/yr and a single mussel farm at current with almost 5 t/yr production. But with more hopes for future development. Despite of this situation, the increase in the demand for bivalves and for food consumption in recent years has encouraged the harvesting of mussels from natural populations (much affected in the last years because of Rapana invasion), growing mussels on floating installations (long-line systems) and acclimatization of high-value bivalves - (the Japanese oyster is already tested), for instance, with small encompassed spatial conflicts, because the used sheltered areas were located in the vicinity of maritime constructions/dam. The threats in relation with habitats damage and water pollution sources in the vicinity of bathing areas usually were not considered as important, due to nonexistence of aquaculture facilities installed in marine protected areas such as Vama Veche (marine underwater) Reserve.

Given that shellfish culture is still little developed in the Romanian Black Sea, due to the social and economic (market demand), the weakness and threats to the deployment of shellfish mariculture were identified ias a more limiting factors, especially: the constraints related to environmental factors (climate, salinity, exposed coastline, no sheltered areas), the difficulties in integrating mariculture with other uses of the marine and coastal environment (transport, tourism, etc.), respectively the conflicts on maritime space use, as well the potential harmful algal blooms (HAB) and bacterial outbreaks (food safety), in relation with maritime pollution (oil spills, wastewater outfalls, etc.) sources associated with maritime ports locations.

The regional aquaculture implementation (site selection and multi-use) and operation (support for management decision), in order to overpass in particular, the environmental issues of low-salinity plumes (very often Danube river plume), siltation, Harmful Algal Blooms/seasonal hypoxia, but also the exposure to contaminants from waste water (bacteria outbreak) will be considered as a main alternative to fish resource exploitation. On the Romanian coastal area, the intensive fish or shellfish farming involving the organic material/solids and nutrients discharge in the marine environment or dangerous exotic species (like African catfish, recently), is recognized as potentially causing ecologic degradation rather an economic or social priority, due to mentioned, storm exposed Romanian littoral, with various challenges regarding economic sustainability. The single existent aqua-farm is an extensive/artisanal/in early stage industry at Romanian littoral, in the area of Eforie North touristic resorts without affecting adjacent areas' hydrodynamics, but using the sheltered conditions of Constanta Port south jetty.

The aquaculture in Romanian waters increases various challenges regarding economic priority, because the domain is new but in an advanced research stage, that involves the exotic/fresh water species accommodation within a wide exposed shore and strong variable saline regime of the western Black Sea, in the present climate changes effects.

- Human-induced eutrophication (Land-Sea / Sea-Land)

During summer season the nutrients and pollutants enter into the sea at hire concentration due to massive water input, mainly from Danube huge flow, carring all wich collected from the whole catchment area, in the northen littoral first of all. In the southern area of the coast the pressures comes Ffrom touristic facilities, as well the summer intense episodic rainfalls, affecting third step of the coastal waste water treatment plants (especially the WWTP of Constanta North, Eforie South and Mangalia) with outflows in vicinity on the bathing area, thus accelerating human-induced eutrophication processes as well the explosive growth of the macro-algae, followed by collection in quantities of tens of thousand tons of decomposed macroalgae from the shoreline. In accordance with the requests of Public Health Directorate the impacts of eutrophication in Romanian touristic bathing areas should be controlled and maintained by local administrations and Romanian Waters Authority, but its capacity is often under the advised and rapid intervention.

- Substances, marine litter (Land-Sea / Sea-Land)

Despite of the existent ecological rules and regulations of coastal industry and maritime transportation, considered in connection with Danube-Black Sea channel/Danube River transport, in the last years there were several assessments of the ecological impacts of the various sources of substances and marine litter materials, gradually accumulated in the areas of the coastal and marine ecosystems, generally through transport concentrated vectors from land to sea, but also diffuse ones from sea to land.

The regional tourism and recreational activities within Romanian littoral, even it is reduced (only at three months by the seasonality of a temperate climate), it also has a strong ecologic pressure on the natural coastal ecosystems, due to its uncontrolled massive releasing of marine litter, thus aggravating the loss and damaging the coastal habitats. Wastes coming from the diffuse sources landward, those which are due to shipping, cruise tourism and extraction industry provokinge strong pollution, as well as increasing solid plastic wastes and various marine litter, thus having a strong ecological and social impact, due to its contamination of the coastal water and habitat quality with damage of landscape attractiveness;, and coastal tourism and beach-based activities during summer season, in consequence, in the source and in adjacent areas, but also in offshore area.

- Telecommunication (Sea-Land)

Telecommunications are related to the disposal of the submarine cables, sometimes associated with pipes and underwater hubs, thus requiring an assessment of involved LSI. In the western Black Sea, it is a highly relevant human economic activity with a large priority, being under the influence of the marine and coastal hydrodynamics and anoxic regime extension at lower depths of the western Black Sea. As part of the information iinfrastructure, the marine cables of the Romanian seaside are related to the Euro-Asian communication infrastructures, with special hubs in the area of Constanta, Mangalia and Midia maritime Ports, being in direct linkage with the development of the European communication infrastructures.

- Shipping and ports (Sea-Land / Land-Sea)

The three Romanian Maritime Ports of Constanta, Midia and Mangalia are affected directly by extreme wave regime under present climate changes, its extreme storm return periods of 100 years are expected to consistently affect some of those coastal/maritime transport hubs with significant implications on coastal infrastructure maintenance serving maritime activities with economic and social priority, particularly within ports jetties or defense breakwaters. Romanian ports transits approximately 60 million tons of goods annually and its encompassed operations can produce significant pressures on both the aquatic environment and to the shore area, affecting water and air quality, producing environmental and underwater noise.

The continuous development of the port infrastructure, always necessary for the development of the economic and industrial activities adjacent to the maritime transport, can create modifications of the hydro-morphological processes, modifying the circulation patterns of the sea currents but also the integrity of the seabed, thus inducing the sediment unbalanced situation downstream.

Port activity and associated coastal protections as principal activity related to maritime transportation, the activity in the Romanian marine waters haves a high economic priority due to its involvement at Constanta City socio-economic importance, supporting jobs and transportations and housing/urban development sectors., bBut the extensions of ports as marine obstacle was the main cause of coastal erosion (due to blockage of the southern littoral drift), as a significant issue and risks with a strong socio-economic impact;, as they can required certain coastal infrastructure against erosion, generated by coastal sediments drift interruptions along the coast;, thus requiring in consequence protection works extensions, as corrective actions and important financial support to strength the coastal protection infrastructures in the context of climate change. Also, the associated possibility of introducing alien species should not be neglected due to the non-compliance with the rules regarding the treatment of bilge-water.

- Extraction of non-living resources: extraction of water (Land-Sea)

For coastal protection of the Romanian littoral and for touristic beach facilities extensions the entire southern littoral is in a phase of an intense arrangement within a major ongoing protection scheme involving the (re)construction of protective coastal construction in connection with sand nourishment of all touristic beaches cumulating an input of about 20mil cubic meter sand on the shore-face and nearshore.

This huge sediment supply borrowed from offshore area is becoming a source of a radical change of LSI type of interaction on Romanian shore, were large coastal habitats will be covered by sand, even in the case of the Sarmatian plate presence. Due to the fast terms of implementation, the specificity of LSI can be completely changed for long period of time, as well the coastal marine habitats which existent in the adjacent areas of the arranged shore.

3. Scoping of LSI working process, common definition and analytical framework for LSI in the Black Sea cross-border context

3.1 General scoping of LSI working process

The most important challenges of the MARSPLAN-BS II project work process included: setting up a common conceptual framework and a definition of LSI, finding the ways to work across different planning stages and mandates, capacity constraints, and contacting and mobilising relevant stakeholders. To resolve all these issues, a conceptual LSI framework was developed taking an adaptive and learning approach in the various tasks, and taking the time to work with the issues.

3.2 Towards a common analytical framework and definition for LSI in the Black Sea cross-border / cross-level context

In setting and refining a common LSI framework, drawing perceptions and insights from previous works and projects was a key activity. There are a wide range of other studies and EU projects and associated methodologies that elaborate particular aspects of LSI understanding. They can assist LSI stakeholders in operationalising LSI considerations in their daily processes and practices. **For instance, many insights and aspects of the the European Commission`s DG MARE LSI Brief paper (Malta, 2017), SUPREME, CAMP Italy, Pan Baltic Scope and ESPON MSP-LSI projects match the insights and the approach taken in MARSPLAN-BS II project.** This approach reflects the cross-border focus of MARSPLAN-BS II for countries less experienced in MSP and working with actual LSI challenges in a problem based manner. It must be recognised that LSI will involve significant spill over effects beyond the coastal strip and indeed many of the key benefits might be felt well beyond this area. Initial reflections on previous works suggest that perhaps most effort so far has been devoted to considering LSI from seaward and environmental perspectives. What appears to be the biggest shortfall at present is elaboration of landward, socio-economic and governance LSI perspectives [26,28,39].

Although there is currently overthinking and overcomplicating the LSI concept, it has become apparent that 'land-sea interactions' may be more complex than the term suggests [8]. The MSP-LSI literature/ practice review revealed the absence of a widely recognised definition of LSI, instead a number of good-practice examples to reflect upon mostly project-based and basin-oriented (for example Baltic Sea, Mediterranean Sea, Northern Atlantic). Almost all available LSI definitions have drawn attention to the interactions between environmental and socio-economic factors/uses across the land-sea interface, while some also include reference to governance connections/systems. In addition, the need for a two way LSI perspective looking from the land to the sea and from the sea to the land has been encouraged. Reference was also made to 'influence and impact' which reflect central concerns in MSP related to both LSI opportunities and risks [26,28].

A general Framework for LSI developed by European Commision`s DG MARE (2017), Briefing paper at LSI Malta Conference in July 2017 describes LSI as '***a complex phenomenon that involves both natural processes across the land-sea interface, as well as the impact of socio-economic human activities that take place in this zone***'.

Based on such general definition, in the scope of MARSPLAN-BS II project, the Land-Sea Interactions in the context of coastal and maritime spatial planning refer to a 4-dimensional conceptual/analytical framework in a two way LSI perspective looking from the land to the sea and looking from the sea to the land (see **Figure 8**):

1. Interactions related to natural bio-geo-chemical processes across the land-sea interface and their interference with human activities both on the land and the sea;
2. Interactions between socio-economic uses and activities at the sea and at the land, considering also their impacts on coastal and marine environments;
3. Governance, spatial/planning systems and institutional frameworks managing LSI;
4. MSP process related aspects.

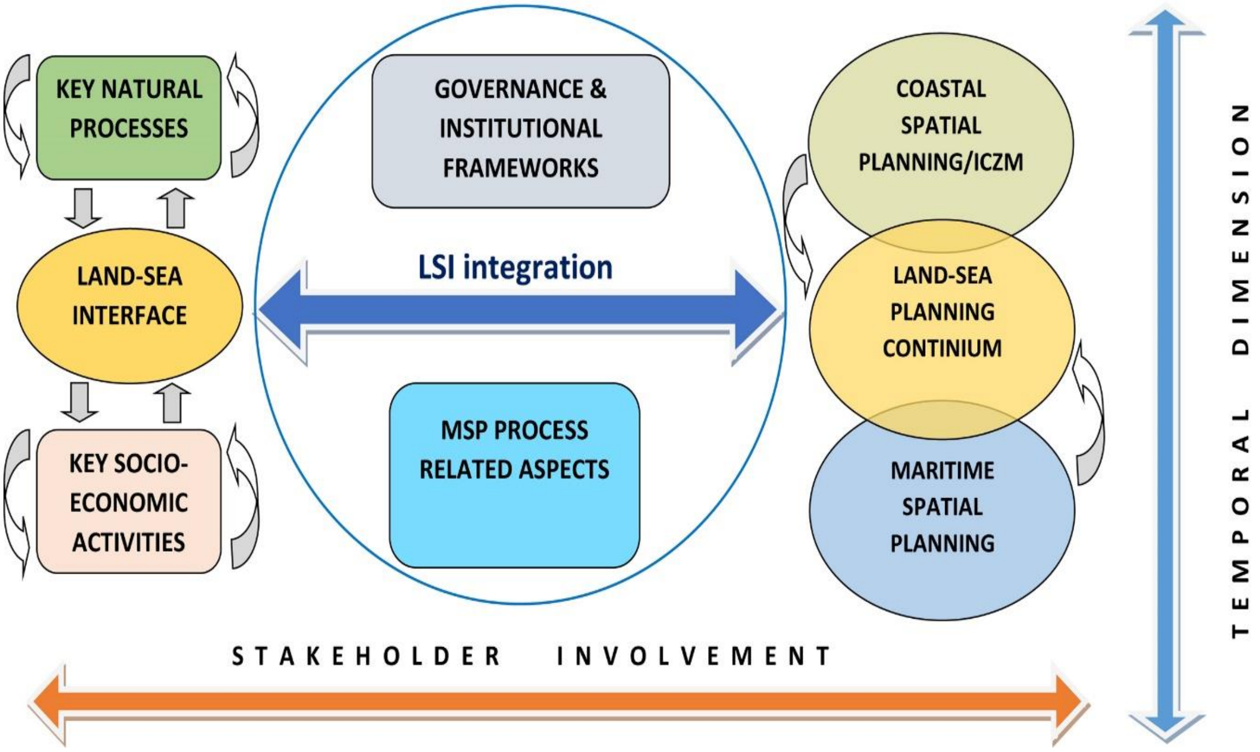


Figure 8 LSI conceptual framework for Black Sea (Bulgaria & Romania) (*developed by CCMS*)

Stakeholder engagement and temporal dimension are horizontal and vertical cross-cutting linkages to the entire framework.

Respectively, our LSI definition is (see **Box 2** below):

Box 2: MARSPLAN-BS II LSI Definition

Land-Sea Interaction (LSI) is a complex phenomenon that involves interactions related to natural processes and interactions between socio-economic uses/activities, and with(in) the coastal and marine environments in both directions, the governance arrangements/frameworks for managing these interactions and possible ways for their integration into the MSP process.

3.3 From general scoping to specific/critical issues and conflicts *(Bulgaria and Romania case studies testing the proposed LSI methodology with a focus on coastal erosion)*

The LSI methodology, proposed in the next chapter 4 below, will be tested in two case studies in the cross-border region of Bulgaria and Romania: Shabla and Mangalia case study areas with a focus on coastal erosion, land-based sources of pollution, and other key and hot spot LSI. The cross-border area of Bulgaria and Romania is distinguished with large protected Natura 2000 sites, Natural Reserves, large sand beaches, coastal and underwater cultural heritage, and thus implying a great potential for the development of sustainable coastal and maritime tourism. At the same time, the cross-border area faces significant current challenges such as one of the highest rates of coastal erosion, pollutions from the land-based-activities, etc.:

1. Shabla case study area: includes the Municipality of Shabla and maritme space, located along the northern Bulgarian Black Sea coast from Cape Sivriburun on the border with Romania in the north, to Cape Shabla in the south. The area of Shabla is low urbanised and comprises large natural sand beaches, vast dune fields, coastal lakes and rapidly retreating loess cliffs. Part of the area is low-laying and thus being vulnerable to climate change and associated sea level rise, flooding and coastal erosion. There are valuable natural protected areas (Natura 2000) and wetlands, important Ramsar sites, such as: lakes of Durankulak, Shabla-Ezeretc and Shablenska Tuzla, which support a huge biodiversity of flora and fauna. Wetlands are important providers of all lake-sea water-related ecosystem services (regulate water quantity, groundwater recharge, contribute to regulating floods, etc.). The Shabla study area is located at the route of migratory birds along the western Black Sea coast, Via Pontica, and provides space for birds wintering, breeding, resting and feeding. The loess cliffs of Shabla study area have some of the highest cliff erosion rates along the Bulgarian coast. Coastal erosion is the major challenge for Shabla case study area - balancing the need for mitigation measures and an integrated management approach that considers both protecting coastal ecosystems and threatened infrastructure. The economic and social development of Shabla study area is sustained by agriculture, oil and gas extraction, small scale fisheries, and activities based on natural settings as eco-tourism, camping, scuba diving, snorkelling, cliff climbing, cave diving, surfing/kayaking, swimming, windsurfing. Lakes also provide conditions for fisheries, birds watching. The Shabla area is rich in remains of coastal and underwater cultural heritage, such as the Eneolitic settlement of 4600-4200 BC in Durankulak Lake.

2. **Mangalia case study area:** includes the coastline of Municipality of Mangalia, placed on southern unit of the Romanian coast, stretched from Tatlageac lake/Olimp touristic resort to 2 Mai/south of Mangalia Port. The area of Mangalia is an urbanised area, containing six touristic resorts Olimp, Neptun, Jupiter, Cap Aurora, Venus and Saturn and a medium size city of Mangalia. As a littoral area, the Mangalia municipality encompass several artificial beaches and a natural one, as well as a completed coastal protected and arranged shore on a beaches and cliffs side. In present time the protected beach areas are now in a renewing and rearrangement stage, in order to strength the shore vulnerability to coastal erosion, due to lack of sediments and sea-level rise, but also due to slight maintenance of coastal constructions. For coastal erosion mitigation there is a developed Masterplan for coastal protection in implementing phase in the area of Mangalia as a part of the southern Romanian. The area encompasses two MPAs, in the submerged adjacent areas of ROSCI0281 - Cap Aurora and ROSCI0094 - Submarine sulfur springs in Mangalia, with a significant diversity of habitats, which shelter many distinctive plant and animal communities. A wide wetland is located in the area of the Saturn touristic resort, the swamp of Mangalia, as a bounded lake and natural protected area, as well as a shelter for migratory birds in transit toward Danube Delta. The

economic and social development of the Mangalia study area is sustained by coastal mass tourism, shipyard, agriculture and local scale fisheries. The Mangalia area is comprising an antic Greek city of Callatis, which now are covered by seawater, a colony of Heraclea Pontica, sited around 6th century BC. In the study area it is placed a major maritime port, including a touristic port and a navy port, as well, including military area.

4. Proposed methodology for LSI analysis: a step-by-step approach

Based upon the desk research of existing LSI studies and practices related to MSP/terrestrial planning, a methodological approach to exploring LSI and integrating them in the MSP has been proposed using the insights and perceptions from past and ongoing MSP studies and projects (good practice models and outcomes). This includes:

- **a common conceptual framework for analysing LSI and considering LSI in MSP;**
- **a proposed common working definition of LSI**; and,
- **a methodological guideline or methodology for more detailed analysis of LSI** (with a particular focus on coastal erosion and other hot spot LSI in the cross-border region) **as well as for integration of LSI in the MSP process**.

Few research questions have arisen from the desk analysis on results and synergies with other MSP projects and throughout the study: What does LSI mean in different national and sub-national settings, and how can LSI be integrated in MSP in a meaningful way? How does LSI play out in cross-border contexts, and what are the implications for MSP? [8].

Following the common analytical LSI framework for the Black Sea (Bulgaria and Romania), in the context of MSP and in a two way LSI perspective (looking from the land to the sea and from the sea to the land), interactions might involve environmental, socio-economic and governmental aspects and arrangements. Categorisation of LSI elements can help in structuring problems understanding, and generally an integrated perspective is required to address all these aspects of LSI [3]. As most practices show the institutional fragmentation between (and within) land and sea has been proved as another big challenge, which is further exacerbated by the often-existing mismatch between administrative boundaries and the scale of natural and socio-economic LSI processes, and if the cross-border context is required. Also, clarifying mandates, roles and division of responsibilities across the land-sea interface is another key challenge in a multi-level governance setting and it is often difficult to balance the development of national MSPs with the need to do cross-border work.

It should be emphasised from the beginning that a one-size-fits-all approach to address LSI issues within MSP might not be appropriate when considering different national and subnational, and cross-border contexts. The selected approach to be used not only depends on the specific characteristics of the area, but also on the scale of analysis [3]. The common LSI framework entails deeply complex and dynamic phenomena; however, it provides a means of stepping into this complexity in a structured way: LSI involve the intricate and constantly shifting interconnection between socio-economic activities both in the sea and on land with natural processes that span the land-sea interface. The experience in both these dimensions is also influenced directly and indirectly by governance arrangements related to marine and terrestrial areas. This could act as an initial checklist in identifying which LSI issues merit particular consideration in a local context. All these points require institutional and governance knowledge and capacity building of relevant stakeholders, and coastal and maritime planners [8].

As highlighted above many insights from SUPREME project match the approach taken in MARSPLAN-BS II project. The methodology proposed in this report capitalises the LSI results of SUPREME project and could be used as a reference point for scoping of LSI issues in different MSP contexts. Based on the LSI experience and results obtained under the first MARSPLAN-BS project (Case Study 3 Burgas: Land-Sea Interactions and Mangalia-Shabla draft MSP planning) this activity aims to identify and practically work on important aspects of the LSI in the cross-border region. The common Geographic Infromation System (GIS) database, established in the MARSPLAN-BS project, will be used and updated with newly available data and spatial information for the cross-border region. The adapted methodology for analysis and integration of LSI in the MSP could be used as guidance for further repetition models applicable to the national MSP plans of Bulgaria and Romania. The adopted three-step approach proposes an integration process at different levels, which can be replicated in other coastal and sea contexts.

With these considerations in mind, several key operational elements for the proposed LSI approach have emerged in the working process:

- **Firstly**, two typologies of LSI should be considered: interactions due to natural processes and interactions due to human activities on the land and in the sea;

- **Secondly**, LSI consideration must embrace a two way perspective: looking from the land to the sea (how landward developments influence on and support marine developments and how this impacts on the environment) and looking from the sea to the land (how sea uses support the landward activities and how they can influence on coastal environment and wellbeing of coastal communities);

- **Thirdly,** temporal dimension of LSI should be also considered especially when taking into account the interactions between natural processes;

- **Fourthly**, although MSP is a national endeavour and considerations to LSI have specific study and local context, cross-border and transboundary dimension should be also taken into account, as the maritime areas with uses and environment might by affected in the cross-border and transboundary dimension. The added value of MARSPLAN-BS II project is its explicit cross-border context;

- **Fifthly**, in relation to the more detailed analysis, identifying the specific hot spot areas for LSI (e.g. major port infrastructures, land-based pollutions, coastal nursery habitat, etc.) is also needed;

- **Finally**, the proposed methodological guideline capitalises the experience and results of SUPREME project and take inspirations and insights from other EU best practice studies and projects as DG MARE LSI Brief paper [1], SIMWESTMED, CAMP Italy, Pan Baltic Scope, ESPON MSP-LSI, etc.

Adapting the SUPREME LSI approach, the MARSPLAN-BS II LSI methodology will include a step-wise process considering an initial and more general stocktaking phase (PART A), followed by an in-depth analysis about most relevant interactions (PART B), and concluding with a final phase (PART C) to inform the planning process on the key outcomes from LSI analysis.

PART A and PART B of the step-wise process are proposed as two different levels of analysis according to a tiered approach:

- **PART A** is intended to be a preliminary analysis phase, aiming at identifying most relevant elements for LSI, and generally considering, all known land-sea interactions in the study area.

- **PART B** represents a focused analysis phase, to be carried out only for the most important interactions, selected within PART A. These interactions are those relevant for MSP key issues, identified in the first phase. By this approach, some steps in PART B are intended to deepening the analysis carried out to the corresponding steps in PART A. Namely, the tiered approach of SUPREME project allows for the application of the methodological guideline to different stages of MSP cycle: to contexts where the planning process is yet in a preliminary phase and knowledge and information are still to be collected; and to contexts where the planning process is already more advanced. In this second case the guideline could be applied starting directly from PART B or using PART A only to re-organise available knowledge, data and materials according to the needs of the in-depth analysis.

For Bulgaria and Romania, being much less experienced countries in MSP, testing and applying PART A should be the starting point of LSI analysis and integration. Such step-wise approach provides flexibility to the methodological guideline, which is useful to both organise available knowledge on LSI and gather new information in a structured framework, as well as avoiding duplication of efforts. It is suggested that LSI analysis is embedded within the process of preparation of an MSP plan, the proposed LSI steps are clearly linked to some of the typical MSP phases.

Provide active, iterative and continuous engagement of relevant key stakeholders is needed to all phases of LSI methodological guideline. As LSI steps are interlinked to the corresponding phases of the planning process, the methodology should also include relevant stakeholders and authorities in an early stage, as well as identifying, informing and mobilising those stakeholders and linking them (also across borders). Active engagement of stakeholders is a key component of the adapted methodological guideline, and it is specifically foreseen in selecting the key LSI interactions (at the interface between PART A and PART B, in Step 8) on the basis of a preliminarily compiled LSI catalogue. As for the overall methodological guideline, it is essential that stakeholder engagement in LSI analysis is integrated as much as possible with the process of stakeholder involvement foreseen by MSP.

Governance of land sea-interactions, especially when dealing with multiple LSI issues, also has specific process requirements, e.g. in terms of which stakeholders to include and which knowledge bases to draw on. It is not only about to contact stakeholders, but it also requires building trust, collecting data and analysing conflicts to produce planning evidence and reflecting on how to approach different stakeholders to include their knowledge, needs and views. With an LSI perspective, known data gaps and quality issues become more challenging as even more types of knowledge are needed [8].

4.1 Part A: LSI stocktaking

4.1.1 Step 1: Define the LSI spatial extent (or geographical range)

The definition of the LSI spatial range is strongly interlinked to the geographical scope of the MSP plan to which the LSI analysis is foreseen and intended. Thus, the geographical range of LSI analysis is often a case-specific and related to the specific MSP context, but it is generally applied to the entire MSP area as well as aiming to identify the LSI hot spots in the phase of a more detailed LSI analysis.

In relation to the planning domain, LSI geographical scope has to consider the territorial context, the natural processes involved and the human activities occurring at land-sea interface. These elements define the so-called 'functional scope' of the analysis [3]. Taking into account such elements, often the spatial domain of LSI analysis could be larger than the MSP domain. The LSI spatial domain could be also limited to local areas or focused on sub-national planning territories, etc.

The extension of the maritime plan, the portion of the coast involved and its characteristics, relevant processes and activities are used to define the geographical scope of LSI. Natural processes and human uses landwards are considered to the extent their management is relevant for the conditions of the marine areas and maritime activities. This step is needed at the beginning of the process to set the boundaries of LSI analysis, but since the spatial domain has to consider the relevant matrix of interactions – this step should be re-taken after having developed an in-depth spatial analysis of each key LSI interaction (step 10).

The extension of LSI scope landwards is defined on a case base, because the 'functional scope' of LSI depends on physical characteristics, human activities and natural and socio-economic processes, as well as on the governance aspects. As a guiding principle it can be considered that the landwards limit of the analysis has to be always related to the scope and needs of the maritime plan. Conditions and process taking place on land should be considered only to the extent they are relevant for maritime activities to be planned.

For instance, in the pilot MSP plan for the cross-border area of Mangalia – Shabla, for the spatial plan area located at the border between Romania and Bulgaria, its delimitation took into consideration two types of zones: the territorial waters (the management area) and coastal area, and the EEZ (the extended analysis area for the study of interactions). The external context analysis of the plan area took into consideration the area contained by the boundaries of the NUTS 3 units, adjacent to the country border and the EEZ limit, in order to identify sources of influence (e.g. pollution sources, migration of fauna, transport routes, exploration and exploitation areas, etc.).

In this first step a number of criteria can be identified to delimitate the area of LSI analysis, such as [3]:

- **Scale of the plan:** continental, regional, sub-regional, national, sub-national, local;
- **Coastal characteristics:** hydrography, geomorphology, bathymetry, etc.;
- **Administrative boundaries** on the land component of the coastal area;
- **Maritime boundaries** defined according to national laws and international conventions.

Additionally, broader criteria could be taken into considerations:

- Relevant socio-economic processes, outside the plan area, that are (can be) drivers of change: e.g. socio-economic and geopolitical conditions in the area can influence the typology / intensity of maritime transport, determining the flows of people and goods across the land-sea interface;
- Natural process outside the plan area that can be relevant for the LSI and the plan itself: e.g. the presence of large rivers and dynamics of sea currents can contribute to increased pollution (including deposits or marine litter) to the plan area (for instance Danube River).

4.1.2 Step 2: Identify interactions

In this second step, current, existing and potential land-sea interactions are identified, the latter being derived from actions foreseen by the available planning instruments (see Step 5 – Identify key policy-legislation-planning aspects). Interactions can refer to transfer of matter (e.g. water), goods (e.g. sand, oil, fish, etc.), people (e.g. through cruising), information (e.g. through environmental monitoring) across the land-sea interface. These flows can have environmental and/or economic and/or societal implications [16,23].

As indicated in section 1.3, when identifying interactions, we need to consider them in a two way perspective: 1) land towards sea and 2) sea towards land. Such perspective includes interactions related to natural bio-geo-chemical processes across the land-sea interface and their interference with human activities both on the land and the sea; and interactions between socio-economic uses and activities in the sea and at the land, considering also their impacts on coastal and marine environments, should be taken into account. The natural LSI refer, for example, to coastal erosion, land-slides, transport of river sediments, flooding. The human-induced LSI refer to pollution from landward activities, marine litter, increased resuspension caused by dredging, etc.

Following the SUPREME and CAMP Italy approach, for easier way of LSI identification, a preliminary catalogue of interactions should be established. The following structure is to be considered for this catalogue:

a) Interactions due to natural bio-geo-chemical processes

i) Land → Sea interactions

ii) Sea → Land interactions (SLI)

b) Interactions due to socio-economic uses and activities

iii) Land → Sea interactions

iv) Sea → Land interactions

4.1.3 Step 3: Localise interactions

This third step is intended to localise spatially interactions i. e. to define their geographical location. The way for collection of the geographical location of interactions allows for preparation of a general map for the study area in GIS environment, identifying, at a first level of approximation, the geographical distribution of interactions.

The temporal component of the interactions should be considered also in this step: their location might vary during the year or in a long-term scale. Main areas of interaction can be evaluated already in this step and overlapping between areas of interaction will help identifying conflicts and synergies related with LSI. The mapping requires the use of Geographic Information Systems (GIS) and the collation and storage of spatial data in a standardised geodatabase. While this step is foreseen to be a preliminary spatial analysis, for easier understanding of LSI location, the results of it will be capitalised in the next Phase B (Step 10 intended to an in-depth spatial analysis of key interactions).

4.1.4 Step 4: Describe and qualify interactions

In this section each identified interaction is shortly described in order to explain, from a technical point of view, its nature, what it is about and the reasons why the interaction exists. Each interaction is then evaluated and qualified as positive (+), negative (–) or neutral (0). Following the SUPREME approach, description and qualification can be done in relation to the three dimensions of sustainability:

a) **Environmental:** considering positive or negative effects on the environment of the coast or on the sea, respectively.

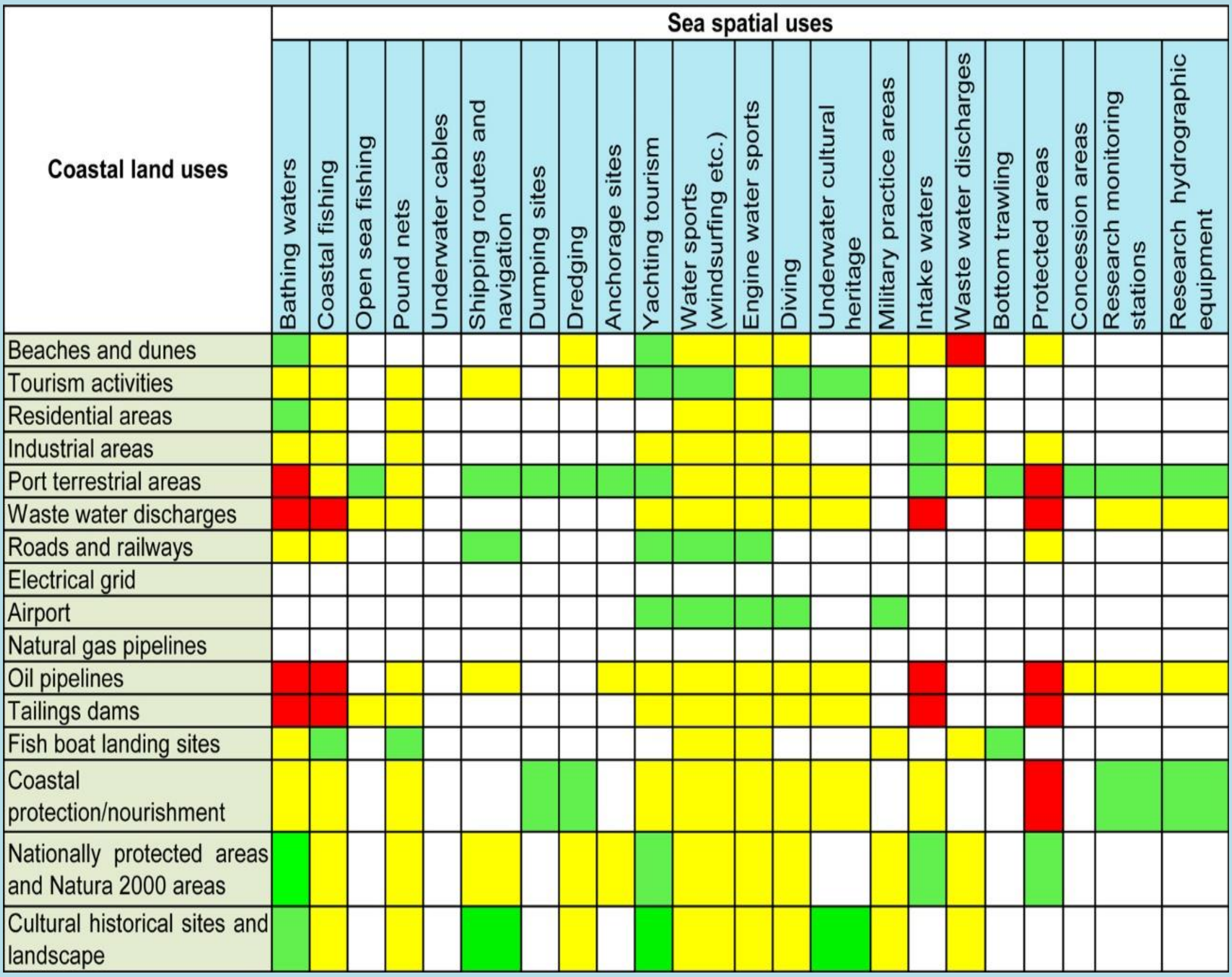
b) **Economic**: considering positive or negative economic effects related with the use of land and sea respectively, and human activities in general.

c) **Societal**: considering positive or negative societal implications of natural or use-related interaction.

It should be noted that the picture of the land-sea and the sea-land interactions actually entails much more complexity, as the same interaction could have positive effects for the economy and society, but at the same tine negative impact on the environment. The complete picture of all interactions is needed to inform the planning process. One good example in qualifying LSI interactions is the first MARSPLAN project and Burgas Case Study: Land-Sea Interactions (see **Box 3**).

Box 3: MARSPLAN-BS, Burgas Case Study: Interactions between land and sea based economic activities and spatial uses, and environment

On the base of produced maps of land/sea uses and of natural values, and analysis on current economic activities and natural landscape in Burgas study area, the main land-sea interactions were identified. The results were shown in a conflict/synergy (land-sea interactions) matrix. In the matrix coding, with green colour are indicated interactions without conflict and compatibilities between land and sea activities, and with environment. With yellow colour are indicated weak conflicts between land and sea uses and with coastal and marine environment. With red colour are indicated interactions with conflicts in the land-sea uses and environment. Empty boxes denote to no interactions identified.



For the study area of Burgas in total 16 different coastal land uses and 22 sea uses were identified. Land-sea interactions without conflict are 44, weak conflicts are 100, 16 conflicts were identified and 192 no interactions between land and sea uses were indicated.

Source and links:

Stancheva, M., Stanchev, H., Krastev, A., Palazov, A. & Yankova, M. 2017. Case Study 3 Burgas: Land-Sea Interactions. Report on WP1, Activity 1.1, Component 1.1.2, Cross border maritime spatial planning in the Black Sea – Romania and Bulgaria (MARSPLAN–BS) Project. June, 2017, 126 p., ISBN: 978-954-9490-49-7.

http://marsplan.ro/en/

http://msp-platform.eu/practices/case-study-burgas-land-sea-interactions

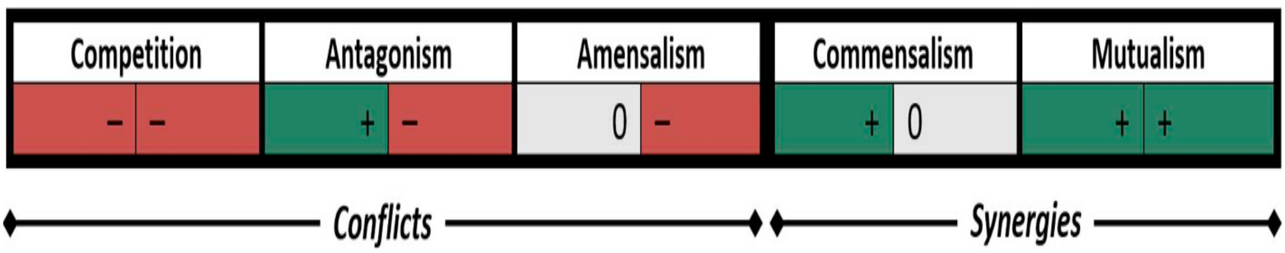


Figure 9 Scale ranking sea use-use interaction types from negative to positive
(adapted from Bonnevie et al [40] and Klinger et al. [42])

As highlighted above, in most maritime planning cases, conflicts and synergies for each sea use will exist at the same time [39,40]. Such tendency creates a need for trade-offs negotiated through the process of weighting and ranking different outcomes as part of MSP processes, where each outcome will include uses typically affected by a mix of benefits and negative impacts [41]. The concept of benefits can be linked to synergies by introducing a scale by Klinger et al. [42]. The scale presents three different types of use-use conflicts and two different types of use-use synergies, going from competition in one end, through antagonism, amensalism, and commensalism, to mutualism in the other end. Whereas the three first interaction types are conflicts, because they contain overall negative impacts on at least one of the uses, the last two interaction types are synergies, since they contain benefits to at least one of the uses and no negative impacts (even though commensalism does not lead to benefits for all uses, no uses experience such an interaction as negative, since it contains no negative impacts, for which reason it can be considered a synergy).

4.1.5 Step 5: Identify key policy – legislative – planning issues

This step aims to provide a general overview of all LSI related EU and national policy, legal and planning aspects and frameworks. This section of methodology is crucial, as the expected outcome of this step is also identification of potential interactions, deriving from actions related to current sector or cross-cutting plans. The step can either be undertaken here (PART A) or included in step 9 (PART B) - in that case the policy, legislative and planning aspects will be considered only in relation with the key interactions selected in the previous step 8.

4.1.6 Step 6: Identify key governance aspects/arrangements

Similarly to the previous step 5, the step 6 is aiming to provide an overview of main regulatory stakeholders with their mandates, roles and power of decisions and influence on MSP LSI aspects. In this step – closely linked to the results from step 5 – the institutions engaged with interactions' topics / processes / sectors in the area are identified.

Governance systems managing different aspects of LSI are identified, i.e. the institutional frameworks for managing spaces and sectors and how they interact (ideally across one space). This must bear in mind that planning in the sea is a relative new that still has to find links to marine sector management at various levels, as well as link up with coastal planning and wider spatial governance systems [8]. The latter is a complex task as spatial land governance systems have developed over decades and even centuries.

This step can either be undertaken here (PART A) or included in step 9: Pathways of interactions (PART B); in the latter case the governance aspects will be considered only in relation with the key interactions selected in step 8.

4.1.7 Step 7: Identify and engage stakeholders

Although listed here as separate step, the stakeholder participation or engagement (see **Box 4** below) for LSI analysis is to be integrated into the MSP overall process of engagement. This is not a separated process, but a specific part of the MSP engagement process. Anyway, interactions on LSI relevant topics can be organised in parallel as part of those relevant for the overall MSP process (see **Figure 11** in section 5 below for a complete overview of the links between the steps of the LSI methodological guideline and the steps of the plan preparation and implementation).

Incorporating expert knowledge and the perspectives of different sea users and interest groups through stakeholder involvement processes is a central element in the design and implementation of marine spatial plans [43]. **Reasons to engage stakeholders in MSP LSI are the following:** as land-sea interactions entail conflicts and synergies, it is needed to examine existing and potential compatibility and/or conflicts of multiple use objectives of the sea management area; to gain a better understanding of the complexity (spatial, temporal, and other) of the marine management and extended area; to gain a better understanding of the human influences on the marine management area; to deepen mutual and shared understanding about the problems and challenges in the marine management area; to gain a better understanding of underlying (often sector-oriented) desires, perceptions and interests that stimulate and/or prohibit integration of policies.

Some stakeholders involved in LSI can be the same ones involved in planning process (e.g. those with specific interests in the sea space) but others could be engaged specifically for LSI (e.g. those with specific interests in the coastal area and inland territory in relation with the sea). Nevertheless, a stakeholder active role in discussing and selecting key LSI interaction is foreseen. Relevant stakeholders are identified, with reference to the preliminary catalogue of interactions. For example, representatives of institutions engaged in the topics/sectors involved in the identified interactions, representative of research with competence on of topics relevant for the interactions, actors of the governance systems and representatives from the civil society are identified. Brainstorming process can be applied to collect an exhaustive list of people/groups/institutions. They will then be structured according to the common procedures of stakeholder mapping.

In this context, recently published handbook on stakeholder involvement within BONUS BASMATI[50] project provides good practices and insights on stakeholder involvement in marine/maritime spatial planning from the Baltic Sea Region [43]. This handbook explores some of the key issues relating to stakeholder involvement in MSP, including: How to think about involving stakeholders? How to understand their needs? Who to involve? When is the appropriate time to involve them? What methods and tools are needed? What are the drawbacks? And how can a process leader carry out an effective, transparent and fair process?

The handbook is built on work done in earlier MSP projects, including the BONUS BALTSPACE[51], Baltic SCOPE[52] and Pan Baltic Scope[12]. It therefore, pays special attention to key elements, such as providing a detailed analysis of relevant stakeholders during the mobilisation stage and hands-on examples of the main tools and methods for working with stakeholders (**Box 4**).

Box 4: Key concepts for stakeholder involvement

Stakeholder - an entity (group, person, organisation, enterprise or administrative unit) with a stake in MSP - those affecting and affected by acts of MSP (recognised as such or not), which include institutions/authorities, NGOs, businesses, other countries, and the society at large (Morf et al. 2017, p. 9).

Stakeholder participation, involvement, engagement and integration – Although they mean slightly different things, these terms are often used interchangeably. *Participation* and involvement are about allowing different actors some degree of influence over a plan and/or a planning process, while *engagement* and *integration* are more about how to achieve this.
Participation requires various types of ***communication*** and ***interaction*** between planners and participating stakeholders depending on the varying *aims* of participation (e.g., informing stakeholders, sharing knowledge, discussion of a plan/process, making decisions, problem solving). Both parts expect to gain something from this interaction. These ***expectations*** may vary greatly, and thus need to be recognized and communicated. Normally, one expectation is to be able to influence

[50] www.bonusbasmati.eu
[51] https://www.baltspace.eu/
[52] http://www.balticscope.eu/

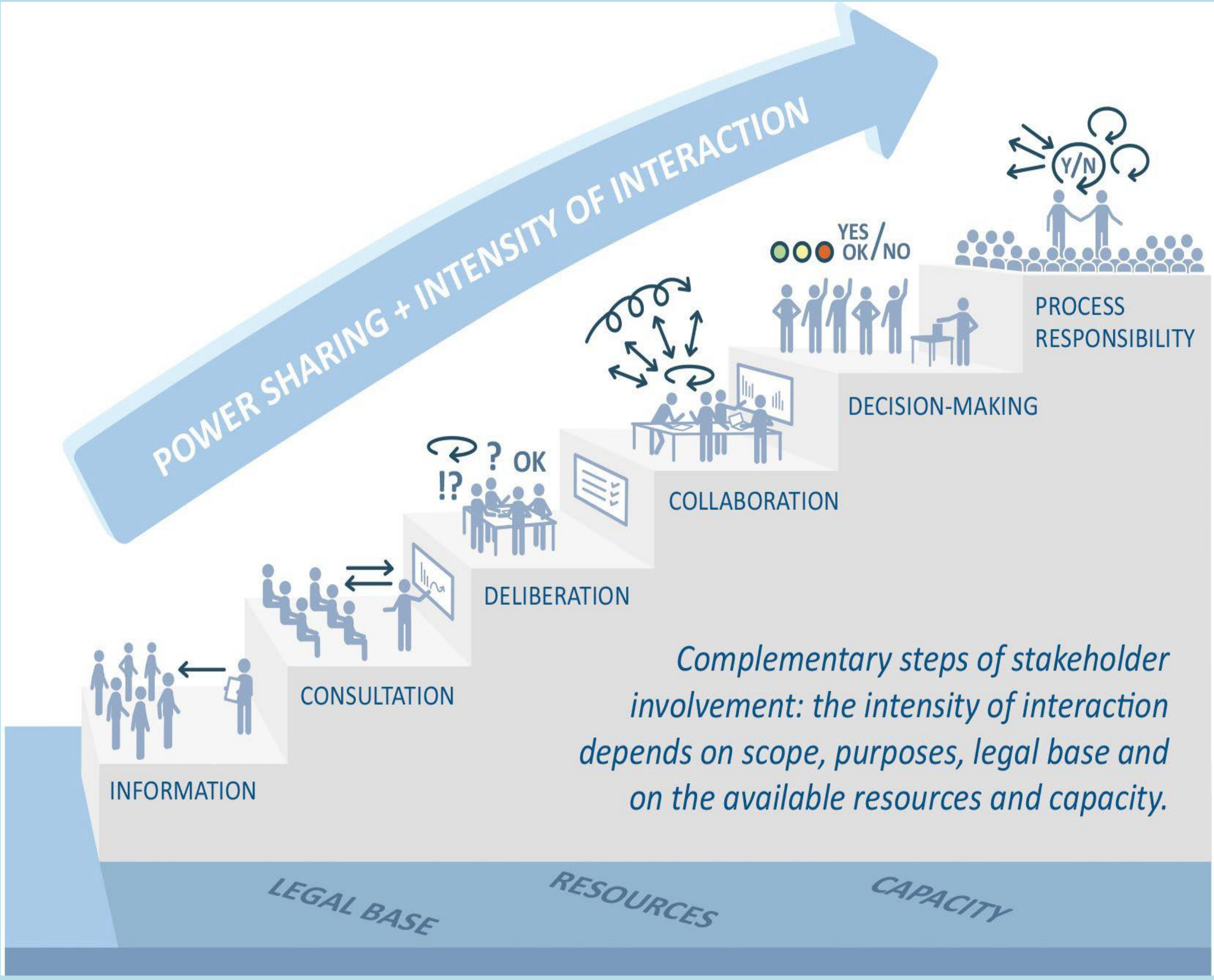
both the planning process and the outcomes. Participation processes are delimited by legislation and the available *resources* (i.e., time, money, infrastructure and personnel) and the *capacity* of planners and stakeholders to participate. There may be high expectations but limited resources and capacity.

Facilitator - A *facilitator* leads the interaction with stakeholders through specific events and/or the whole process. Facilitation requires a mandate, but also special skills and a set of tools. The *facilitator* can be a member of the MSP planning team or someone external to the responsible agency. This may be desirable if neutrality is an issue or if there is no capacity within the planning team.

Tools and methods - Tools are concrete instruments in the hands of a facilitator. Methods are ways to approach specific events or interactions by using a set of tools in a more specific way.

Process - The process is the overall procedure for which a combination of methods and tools is applied over time to address different stakeholder groups, in different constellations and places to fulfil the purposes of participation processes and MSP5. A process leader may be in place to guide the overall process, who may or may not double as a facilitator during events.

Strategy - A strategy describes why, how and when to involve specific stakeholders in MSP.



Stairway of participation in marine spatial planning.
Developed by A. Morf & co-authors using Morf et al. 2019

Sources and links:

Giacometti, A., Morf, A., Gee, K., Kull, M., Luhtala, H., Eliasen, S. Q., Cedergren, E. Handbook: Process, Methods and Tools for Stakeholder Involvement in MSP. BONUS BASMATI Deliverable 2.3, February 2020, www.bonusbasmati.eu.

Morf A, Gee K, Kull M, Piwowarczyk J. 2019b. Towards a ladder of MSP participation. Chapter in Anthology on 'Marine spatial planning – past, present, future', chapter 10 In: Zaucha, J., & Gee, K.(eds). Marine spatial planning – past, present, future. Palgrave Macmillan. Pp. 219-244. ISBN 978-3-319-98695-1 ISBN 978-3-319-98696-8 (eBook); https://doi.org/10.1007/978-3-319-98696-8; http://www.msp-platform.eu/practices/stakeholder-involvement-msp: http://msp.ioc-unesco.org/msp-good-practices/engaging- stakeholders/ : https://iwlearn.net/manuals/marine-spatial-planning-msp-toolkit/4-stakeholder-engagement-in-transboundary-msp

In the LSI process stakeholders are expected to play an active role in discussing and selecting key interactions (step 8). Their role is therefore expected to be active and to take the form of 'stakeholders as partners approach'[53] where the responsible entities for (MSP and) LSI analysis contribute to the analysis on equal terms.

On-site visits and generally touring the whole national or coastal territory can be important for planners to better understand place-specific pre-conditions, needs and interests and to indicate a participatory approach. Swedish planners, for example, explained that visiting municipalities and informing about the MSP process was crucial for showing their intention to conduct an inclusive process, rather than developing a plan that is imposed from above [43]. On-site visits can be especially useful in more complex problem situations and conflicts, as both planners and stakeholders can gain a more diverse and hands-on experience of both context and different problem dimensions. Another way to reach across a larger territory is to use digital material and interaction tools accessible to local authorities and other stakeholders. Online meetings for example reduce travel stress and leave the intensity of interaction to the participants: they could discuss freely and re-connect online when they had further questions [43].

Stakeholders can be grouped under four major categories, as follows:

- **Public institutions and relevant local authorities;**
- **Economic operators of key maritime sectors (inland activities to be also checked according to their impacts on marine areas, in line with LSI);**
- **Experts (research, academia, science, NGOs, etc.);**
- **General public.**

4.1.8 Step 8: Select key interactions

Selection of key interactions represents the final step of the first phase PART A of LSI analysis. It is suggested to undertake this step through active stakeholder engagement. The aim of this step is to prioritise interactions and select the most relevant ones to be considered for further steps. A stakeholder driven and participatory process is suggested in order to engage in LSI analysis a broad range of relevant stakeholders to exchange information, experiences, views, knowledge and culture.

Discussing, prioritising and selecting interactions require sharing of technical information and entering in the details of the selection process. In view of these specific objectives, the following engagement techniques, process and interaction related tools and methods are proposed:

- interviews with key stakeholders (face-to-face meetings or online surveys),
- focus groups,
- local workshops.

Number of interviews, number of focus groups to be arranged and their size (number of

[53] BaltSeaPlan Report No 24 "Stakeholders involvement in MSP": www.baltseaplan.eu/index.php?cmd=download&subcmd=downloads/2_BaltSeaPlan_24_final.pdf

participants) and size of workshop is to be defined on site-specific base [43].

Following the adapted SUPREME approach for LSI prioritisation or key LSI selection the next methodology can be applied (a two-fold process):

1. A preliminary catalogue of LSI interactions (a long-list) is prepared based on the desk research.

2. A first selection is done by interviewing key stakeholders and consulting within 1-2 focus groups. A short-list is thus prepared.

3. The short-list is discussed, presented, amended and finally validated in a technical workshop or in a second round of interview.

Alternative approaches can be used for prioritisation:

- Quantitative approach (scoring): each stakeholder assigns a quantitative score to each interaction, within a pre-defined scoring range.
- Semi-quantitative approach: each stakeholder selects her/his top relevant interactions within a maximum number of allowed preferences (e.g. three, five, seven).

Interactions can be prioritised as a whole, or separately, according to different criteria. **In any case, links should be guaranteed between LSI analysis and the MSP process.** The MSP relevant issues identified for the area by the planning process can be used to prioritise interactions: their relevance for each of the issue can be scored. Alternatively, according to a more general approach, the three dimensions of sustainability (environmental, economic, and societal) could be used as criteria for scoring [3].

Prioritisation using a quantitative approach can be done according to the following steps:

1. Identification of prioritisation criteria (e.g. each of the three dimensions of sustainability).

LSI Interaction	Environmental priority	Economic priority	Societal priority

§ **Environmental Pressures and impacts (including climate change)**: land and sea can determine positive or negative effects one to the other (e.g. the flow of freshwater from river basin can bring nutrients into coastal waters and ensure they remain productive; coastal water circulation can determine beach erosion; maritime traffic can determine impacts in ports areas due to pollution, traffic congestion, crowding of coastal cities, etc.).

§ **Economic effects**: interactions coming from the natural processes or land/sea uses can generate (directly and/or indirectly) added values (as revenues) and/or costs to specific economic activities or economy in general (e.g. sea-level rise can cause flooding and loss of tourism/housing facilities leading to significant economic loss).

§ **Societal effects:** societal added values (e.g. job creation, development of local communities, social cohesion) or negative impacts (e.g. loss of local activities, professions, traditions; tension with economic sectors) can be generated.

2. Scoring according to criteria: scoring metric is defined (e.g. High = 3, Medium = 2, Low = 1, Not Known). This step is undertaken by each stakeholder interviewed. e.g. Stakeholder n. 1.

LSI Interaction	Environmental priority	Economic priority	Societal priority
INT-1	1	3	3
INT-2	2	1	3

3. Integration of scores from stakeholders: average score per interaction, per criteria is computed by averaging the scores from stakeholders (other metrics can be also used). Average scores across stakeholders (results for stakeholder n.1, from previous box).

LSI Interaction	Environmental priority	Economic priority	Societal priority
INT-1	2,1	2.8	2.6
INT-2	1.8	1.2	2.8

4. Integration of criteria: criteria can be integrated in order to make ranking of interactions more operational. Average score by criteria can be computed (other metrics can be also used). Alternatively, criteria can be also kept separated and separated rankings can be provided according to each of them. Key interactions to be evaluated in the following steps of analysis can selected by expert judgement (e.g. with a final focus group).

Spatial specificity should also be taken into account in prioritisation. When developing the analysis at country or regional (sub-country) scale, key interactions can be different in different sub-areas of the LSI analysis domain [3]. Area-specific interactions are therefore identified. Next steps of this methodological guideline might in principle be focussed only on the interactions existing in the identified areas. If this is the case, step 13 in Phase 3 is not to be undertaken and the areas identified here represent already 'hot spot of interactions'.

4.2 Part B: LSI in-depth analysis

LSI in-depth analysis in Part B is intended to be undertaken for the interactions identified as relevant or key during the Part A. As pointed above, in case of more advanced MSP planning contexts, where the aspects included in Part A are already available, the planning authorities should make sure the knowledge and data have been already identified and organised in a catalogue containing the elements indicated above (e.g. localisation, description and qualification of interactions). Phase B should be undertaken also for the new catalogue of interactions emerging as a result of the selections made in the planning process: for instance, such new interactions might emerge from planning decisions; other could disappear or change. If this is the case, a second round of more in-depth LSI analysis is needed.

4.2.1 Step 9: Pathways of interactions

In this step the actual mechanisms behind each selected interaction in Part A are identified and described: they can refer to flows of matter (e.g. pollutants carried by sea currents or originated from land-based sources, extracted oil – gas, sediments), to flows of monetary values (e.g. revenues from economic sectors), or to flows of information (e.g. results from monitoring site at sea or on land). Additionally, in this step, policy - legislative - planning and governance related aspects could be in-depth analysed: comments are included about synergies / reinforcement, conflicts / contradictions and / or gaps related to these aspects, as well as mandates, roles and responsibilities of institutions. The LSI catalogue is complemented with a list of key actors from the governance system. The latter is a relevant element to be considered. In fact, the complex pattern of responsibilities between land and sea has been identified as a key issue of concern in relation with LSI interactions [3,8]. A diffuse uncertainty about who is responsible for what and whether the scale of governance related to LSI issues is fit for purpose has been claimed, together with the existence of a mismatch between administrative boundaries and the scale of natural and socio-economic LSI processes [1].

4.2.2 Step 10: Spatialise interactions

This step is related to step 3 of Part A, where preliminary localisation of each LSI is performed. Here, in this step more detailed specific spatial domain of each interaction is identified and mapped. Spatial domain includes: the area where the interaction is generated (e.g. a point of wastewater discharge located along the coast), the area exposed to impacts/benefits (e.g. the coastal area benefitting from revenues by small-scale fisheries, the marine ecosystems exposed to impacts of sand extraction from the sea bed), or the area in between if applicable.

Mapping of interactions can be finalised at evaluating cumulative impacts of interactions (on land and at sea), thus representing a valuable support to integrated planning of marine-coastal areas, aimed at reducing conflicts between different uses, efficient use of resources, protection of biodiversity and promotion of the principles of sustainable development [23].

For identifying and mapping the interactions, the following elements can be considered [3]:

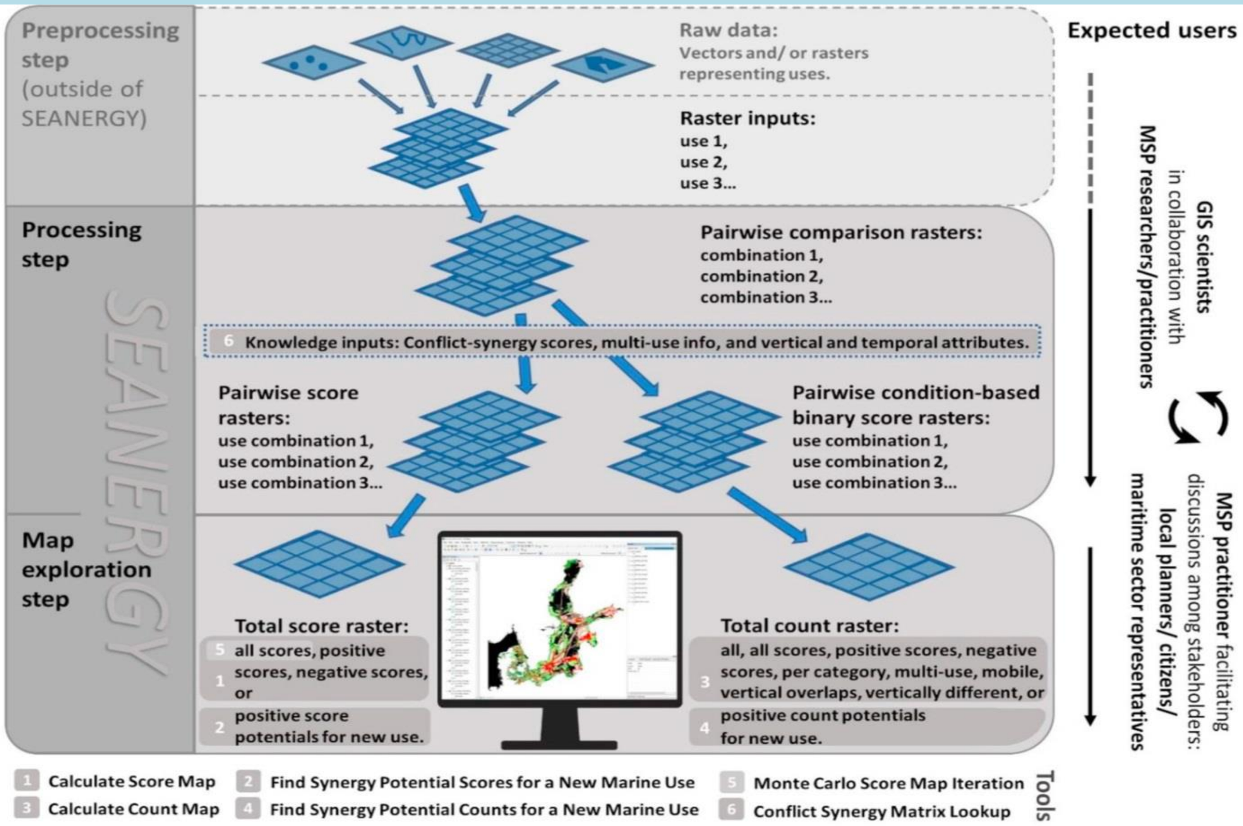
- **Typology and extension of the LSI processes**: widely diffused (e.g. flow of goods, large-scale transport or nutrient loads from large drainage basin) or spatially restricted (e.g. coastal erosion).
- **Spatial and temporal distribution of human activities**.
- **Distribution of ecological elements**: interfaces, ecological connections or ecological barriers.

The overlay of the various data layers presents the current and potential conflicts between sea uses and environment across the marine study area and gives a first indication on the location of the conflict hot spots. Such conflict hot spots could arise due to a number of factors as overlapping of areas devoted to other possible sea uses or in particular area which are ecologically sensitive to human uses or in areas where overlapping uses are spatially incompatible[54]. Spatial information about key interactions is going to be used in step 14 for the identification of LSI hot spot areas. For more details, see below **Box 5**.

Box 5: SEANERGY – a tool for analysing conflicts and synergies between marine human uses (BONUS BASMATI project)

With expanding human uses at sea, the objective of MSP to promote sustainable coexistence between marine uses becomes an increasingly challenging task. In order to assess co-existence options, both use-use interactions and use-environment interactions are important to explore.

Tools for performing Cumulative Impact Assessments (CIA) on the environment provide a means for spatially exploring environmental impacts. Finding inspiration in such ecosystem-based spatial use-environment approaches while drawing on pairwise marine use compatibility knowledge from existing literature, a spatial approach to model potential synergies and conflicts between marine uses through an expert-based scoring system was presented and implemented in SEANERGY, an ArcMap-based opensource toolbox (within BONUS BASMATI project). Based on Baltic Sea GIS-data, SEANERGY supplements CIA analyses with knowledge about potential use-use synergies, potential use-use conflicts, and their spatial extents, useful for optimising the use of marine space in MSP without putting too much cumulative pressure on the environment.



Source and links: Bonnevie, I.M. & Hansen, H.S. & Schrøder, L. 2020. SEANERGY - a spatial tool to facilitate the increase of synergies and to minimise conflicts between human uses at sea. Environmental Modelling & Software, Vol. 132, 104808, 10.1016/j.envsoft.2020.104808. https://bonusbasmati.eu/

[54] http://www.baltseaplan.eu

4.2.3 Step 11: Quantify interactions

In this step land-sea interactions could be possibly quantified, however depending on available data and knowledge. Generally, this step corresponds to pressures / impacts analysis of negative interactions and to evaluation of positive impacts (i.e. benefits, added values) for positive interactions. In this step results available from other policy and sector analysis can be capitalised (implementation of Water Framework Directive (WFD), Marine Strategy Framework Directive, or ICZM strategy/initiatives) (see **Box 6**).

Quantitative information concerning pressure / impact / benefit indicators are included in the catalogue in a synthetic format. Based on the quantitative knowledge, each interaction is ultimately classified as of:

- ✓ **Low intensity**;
- ✓ **Medium intensity**;
- ✓ **High intensity**;
- ✓ **Very high intensity**.

As for the entire methodological guideline, whenever relevant, the interaction is qualified considering separately the three dimensions of sustainability (environmental, economic, societal). This classification is going to be used in step 14 for the identification of LSI hot spot areas. The indicator(s) used to classify the interaction is also specified in the catalogue.

4.2.4 Step 12: Analyse temporal dimension

This conclusive step of Part B is focused on analysis of temporal dimension of interactions. Interactions are qualified as:

- **Irrelevant temporal dimension.**
- **Temporal dimension relevant on the short term** (e.g. on a cyclic base: daily, seasonal; on a noncyclic base: inter-annual variability).
- **Temporal dimension relevant on the long term** (e.g. changes in environmental conditions along years; trends in sector development; changed climatic conditions).

In addition, interactions are evaluated under the future scenarios identified by the MSP process.

Box 6: Good practices and tools for LSI quantification

A number of different approaches and experiences are available across Europe that can be capitalised in this step. In terms of tools available for pressures / impacts analysis the '**DPSIR framework**' (Drivers, Pressures, State, Impact and Response) has been proved to be one of the most relevant ones because it displays well the complexity of interlinks and interrelations in marine ecosystems.

The '**Qualitative Risk Analysis**' (consequence X likelihood) method is also to be considered for risk and vulnerability assessment due to its simplicity and applicability by any end-users, devoicing specific scientific knowledge and technical expertise for its use.

Concerning tools for economic evaluation, the **CBA Tool Kit** – a user-friendly tool for Cost-Benefit-Analysis has been indicated as one of the most convenient to be used.

4.3 Part C: Link the key outcomes from LSI analysis to MSP (inform the planning process)

4.3.1 Step 13: Identify LSI hot spot areas

This step is intended to identify the hot spot areas within a larger area considered for LSI analysis. **LSI hot spot areas are those areas with high intensity of key LSI and SLI.**

Outcomes from step 10 (spatialise interactions) and step 11 (quantify interactions) are considered to identify these areas. As a first procedure, three distinct maps are prepared considering separately the three components of sustainability:

1) Hot spots for environmental interactions;

2) Hot spots for economic interactions; and

3) Hot spots for societal interactions.

After that, an integrated map is produced combining the three previous ones [3].

As highlighted before, this step is not undertaken in case the area-specific interactions have been already identified in step 8 of Part A and the following steps of the methodological guideline have been focussed only on the interactions existing in the identified areas. These already represent 'hot spot of interactions'.

4.3.2 Step 14: Identify key messages from LSI analysis

The aim of this final step is to identify a key message/ or key messages from performed LSI analysis in order to inform the planning process and MSP competent authorities. If needed, stakeholders also could be involved in selecting key messages and this need or possibility is evaluated on a case specific base.

Essential elements for identification of key message can include [3]:

- ✓ Comments about synergies / conflicts / gaps derived from the analysis of policy, legislation and planning context, and of governance system.
- ✓ List of the most relevant LSI/SLI in the planning area (e.g. max 10 interactions) with a short description of their nature (e.g. mechanisms, positive or negative, which dimension of sustainability most relevant).
- ✓ List of key stakeholders to be engaged in order to deal with most relevant LSI/SLI.
- ✓ Localisation of hot spot areas of LSI/SLI and their characteristics.
- ✓ Potential mitigation measures that might be applied to minimise negative impacts and maximise positive impacts can be suggested, together with options for addressing the LSI through plan making.

5. Integrating LSI into the MSP

Some of the proposed LSI methodology steps consistently overlaps with corresponding MSP ones, and shall therefore implemented together also to avoid duplication of efforts and optimise timing. The opportunity to streamline LSI analysis within the process of plan preparation is highlighted also by Shipman et al., (2018) [24] where links are identified with all phases of MSP: **scoping, assessment, analysis and plan making**.

Within the process of plan preparation LSI analysis should be undertaken in two distinct phases: 1) in the stocktaking and analysis phase (Part A), where the existing and potential interactions are identified based on the present conditions of the maritime space and the already planned developments); 2) after scenarios identification, where new interactions could emerge (or disappear) due to the planning selections (see PART B on **Figure 11** below).

Consideration of LSI issues is not only required by the EU MSP Directive, but also by the national MSP legislations. Applying an LSI perspective in an intra-national, cross-border and cross-level governance provide a medium for considering the multi-sectoral approach, the wider planning environment, the respective governance roles and mandates, the distribution of responsibilities and the capacity to coordinate planning. However, LSI perspective implies a lot of complexity in terms of scales and contexts to consider [8].

According to the adapted approach and proposed methodology in this report the entire process of considering LSI can be divided in three main phases (as shown on **Figure 10**):

1. Setting context and following the agreed conceptual framework and definition (as described in chapter 2);

2. Analysing LSI using the proposed step-by-step methodological guidelines (presented in chapter 4);

3. Integrating outcomes and key messages from LSI analysis into the MSP (chapter 5).

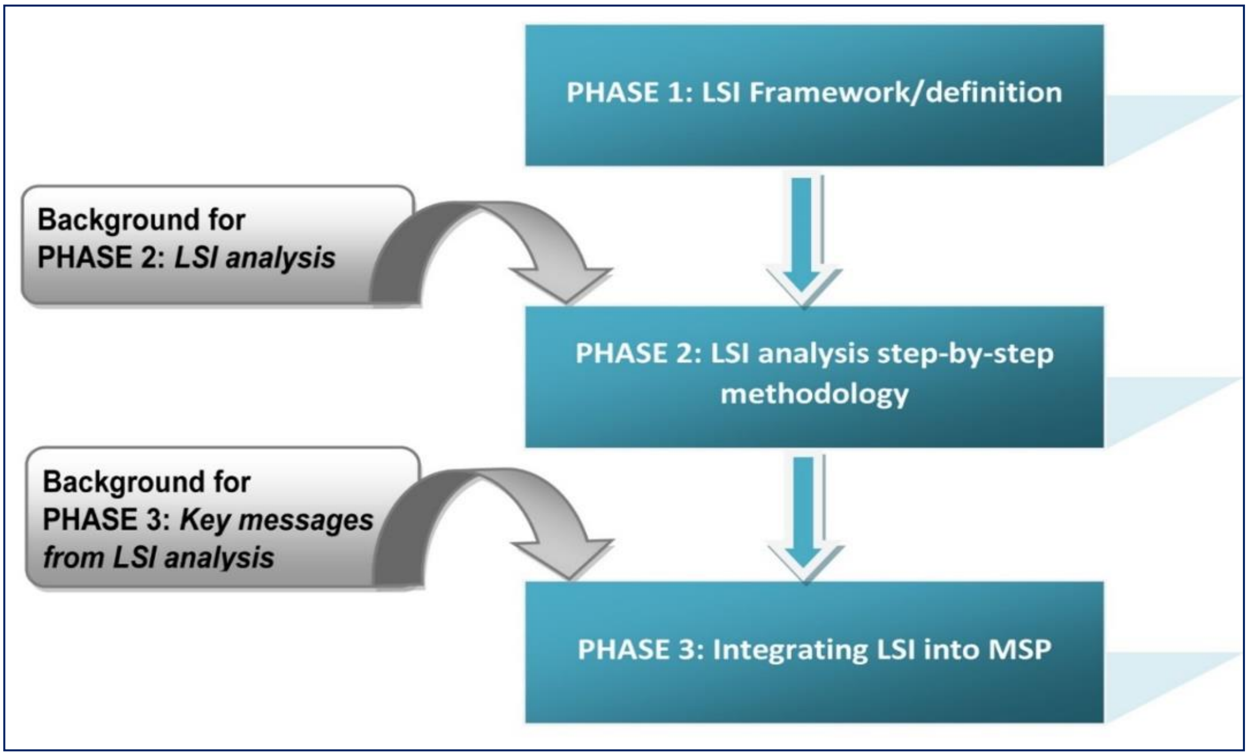


Figure 10 A step-wise LSI flowchart for analysis and integration in MSP
(*adapted from Bocci et al., 2018 [3], developed by CCMS*)

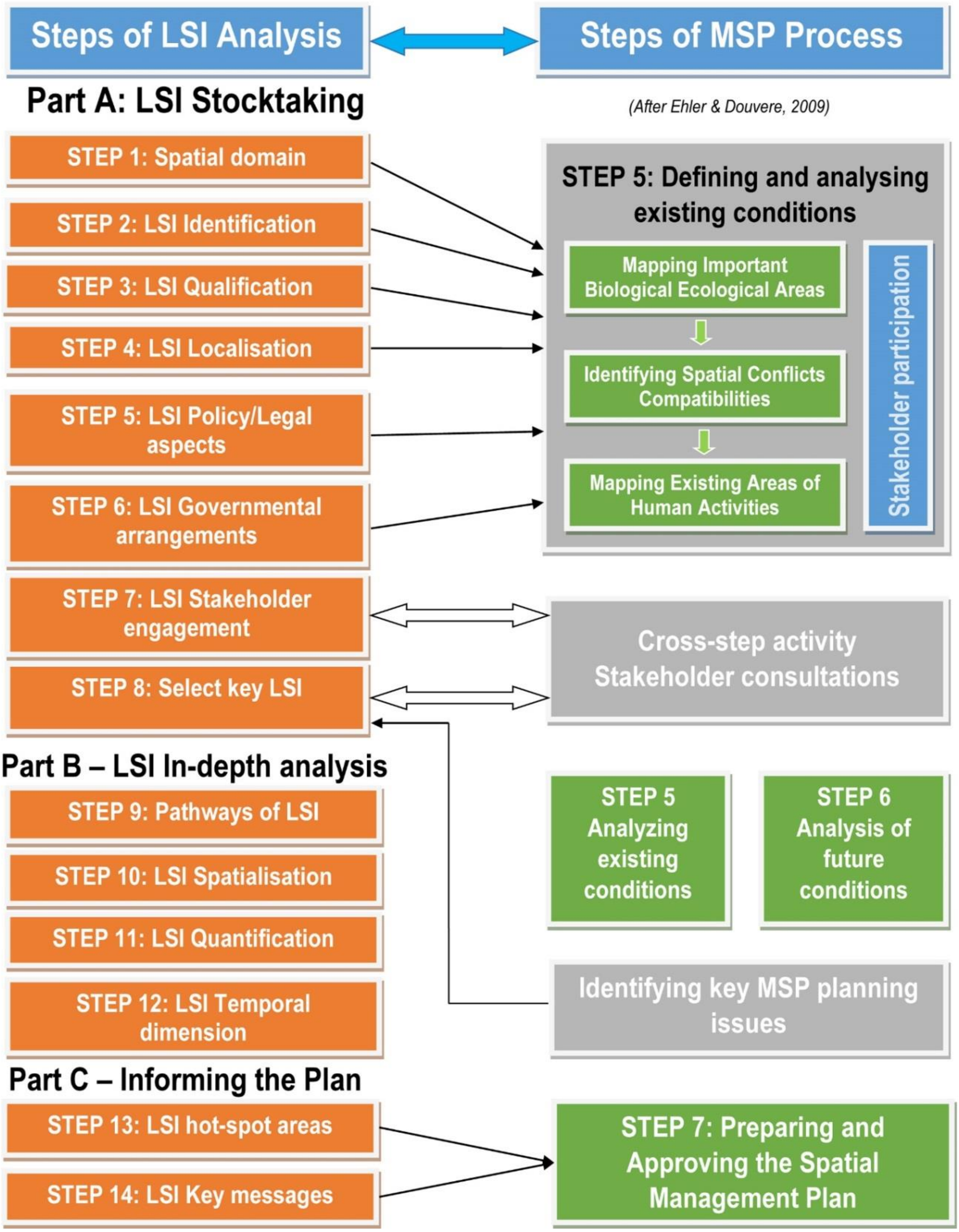


Figure 11 Links between steps of LSI methodology and steps of MSP process[55], (*adapted from Bocci et al., 2018 [3], developed by CCMS*)

[55] after Ehler, C., Douvere, F. 2009. Marine Spatial Planning: a step-by-step approach toward ecosystem-based management. Intergovernmental Oceanographic Commission and Man and the Biosphere Programme. 2009; IOC Manual and Guides No. 53, ICAM Dossier No. 6. Paris: UNESCO.

Figure 11 above provides a snapshot representation about how the proposed methodological guideline for LSI analysis can be integrated into the MSP process.

Transferring of LSI analysis outcomes (key recommendations/messages according to the last step in the methodological guideline) represents the final and the most critical phase in the process of LSI analysis and integrating. It should be emphasised that due to the heterogeneity of planning contexts, the timing and the ways to incorporate LSI outcomes may be different. When planning processes formally recognise LSI (like in the case of ICZM or MSP) this can be done within a clear scheme and governance. When LSI is not formalised as a step in the planning process then informal mechanisms should be established [3]. Anyway, LSI assessment shall be a key component of any process aiming to design a maritime spatial plan, as clearly required by the EU MSP Directive. Finally, it might be too late or too early to fully implement a cross-border LSI perspective as in the present round of MSP, at least for the EU Member States until 31 of March 2021, but undoubtedly this round shall prepare the planning authorities for deeper future coordination and integration across the land-sea boundary - also across countries [8].

6. Results from implementati-on of the proposed LSI methodology in case studies of Bulgaria and Romania

Bulgaria

The proposed LSI methodology for analysis and integration into MSP was tested in the cross-border area of Bulgaria (Shabla Municiplaity) with a focus on coastal erosion, land-based sources of pollution, coastal tourism and other identified key and hot spot LSI. Practical application of methodological guidelines was useful for the identification and representation of the current land-sea and sea-land interactions in the study area. The LSI analysis in the Bulgarian case study was carried out following the common LSI definition and framework accepted at the MARSPLAN-BS II project – conceptual part of LSI. The analysis was done considering the two way perspective of interactions: land-sea and sea land (taking into ascount natural processes and interactions due to human uses). Testing the step-by-step LSI methodology was conducted by application of the three parts of the methodology (Part A, Part B and Part C) with the purpose to follow the entire process with stocktaking, in-depth analysis and key messages from this analysis.

The in-depth analysis was based on the critical issues identified in the study area, such as **coastal erosion, pollution (waste / wastewater disposal / septic tanks and marine litter**), including pollution from oil and gas extraction, coastal tourism, etc. The step-wise LSI methodology is flexible enough and its complete application in the Shabla case study area depended on the availability of data and information, as well as on the awareness and capacity of the involved LSI stakeholders.

Active engagement of diverse categories of stakeholders (including categories that are not usually involved in the planning process) was conducted in the case study for prioritisation and selection of key Land-Sea and Sea-Land Interactions based on the three priorities for sustainability: environmental, economic and social. Such approach was built upon the need to focus the analysis towards already identified issues of priority concern in the study area in finding practical solutions to support land and sea planning processes. The results from the performed LSI analysis are also good foundation to guide future updates and improvements of methodology and to help more in-depth LSI studies in the next rounds of MSP process.

Data availability and acquisition play an important role for the elaboration of coastal and marine spatial plans, including therefore the analysis of LSIs. Data gaps, integration and sharing shall be clearly highlighted. Several limitations and constraints in application of the proposed approach for LSI analysis have emerged: lack of the best available data and information for LSI quantification, and estimation and assessment of interaction intensity; lack of knowledge and capacity in understanding the nature of LSI and its practical application, etc.

For what concerns the precise localisation of LSI, it was difficult to localise the extent of observed interactions and depending on the sector/use of consideration the correct and ideal boundary even widely (i.e. agricultural use can affect a wide area starting from land territory; marine litter and pollution can originate from a land or sea area far away from the spatial domain of study area). In addition, it is a matter of competencies and integration of different levels and typologies of 'planning' (sectorial, land use, maritime, etc.).

On the base of the deck research (analysis on current economic activities and natural landscape in the study area), the preliminary established catalogue of LSI, spatial GIS analysis and the produced maps of land/sea uses and of natural values, all interactions in two way perspectives (land-sea and sea-land) were identified and qualified. The results were shown in a conflict/synergy (land-sea/sea-land interactions) matrix: in total 23 different coastal land uses and 16 sea uses were identified in the study area. Land-sea interactions with synergies are 27, weak conflicts are 106, 47 conflicts were identified and 188 no interactions between land and sea uses were indicated. The coastal land uses with low interactions are *energy industry (onshore renewable energy/wind)*, *transport (road transportation)* and *industry. The transport* (in Shabla Municipality the only one transport network is the road transport, there are not ports and railway infrastructures*)* indicated mostly synergies with sea uses. The highest number of land-sea conflict interactions was indicated for *Wastewater discharge* and *Coastal tourism, sports and leisure activities (e.g. bathing areas, tourist facilities, etc.); Wastewater discharge* interacts with *Aquaculture in seawater, Fishery, Recreation and sports, Marine Protected Areas (MPAs): nationally designated and Natura 2000 zones, Algae bloom/eutrophication, etc. Coastal tourism, sports and leisure activities (e.g. bathing areas, tourist facilities, etc.)* interact with *Infrastructures (civil works of sea/coastal engineering /artificial reefs, breakwaters, groins, etc.), Waste (marine litter from shipping, transboundary sources, etc.), Algae bloom/eutrophication, etc.*

Coastal erosion is common phenomenon for Shabla Municipality, due to the exposed to wave's loess cliff. *Coastal erosion* interacts with *Extreme events (storms and flooding events, tsunami, upwelling), Sea Level Rise (global and local), Infrastructures (civil works of sea/coastal engineering /artificial reefs, breakwaters, groins, etc./), Recreation and sports, etc.*

The sea-land conflicts (uses-uses and uses-environment) that were identified mainly include: *Algae bloom/eutrophication* has negative impact on coastal tourism, terrestrial protected areas and wetlands; *Infrastructures (civil works of sea/coastal engineering /artificial reefs, breakwaters, groins, etc./)* have negative impact on coastline morphology, sediment transport and sustainability of sand beaches and dunes, on *Coastal tourism, sports and leisure activities (e.g. bathing areas, tourist facilities, etc.)*; various types of marine litter from the passing ships and other shipping activities have an adverse impact on beaches and coastal tourism and protected areas. Solid waste and littering can degrade the physical appearance of the water and shoreline and cause serious damages to marine biota. The coastal areas of Shabla Municipality (vast sand dunes and beaches) are popular places for camping during the summer, often unregulated and this causes pollution and fragmentation of the dunes and beaches. Shabla Municipality is small municipality, with limited budget, and to resolve this additional waste pressure more funds and resources are needed. Sea-land military trainings can also affect coastal tourism, beaches, dunes, wetlands and other terrestrial protected areas, and historical cultural heritage. Potential sea-land conflict interaction would result from the oil spill pollution in a marine accident, possibly causing severe damage not only to the marine area, but also to the coastline: wetlands, beaches, coast-protection structures, rocky cliffs and all ecosystems.

The study also identified key land-sea and sea-land interactions, selected and ranked by 15 relevant stakeholders following the three criteria for sustainability: environmental, economic and social (public):

1. Environmental priority. Environmental pressures and impacts (including climate change): land and sea can have positive or negative effects on their interaction (e.g. freshwater inflows from rivers can deliver nutrients to coastal waters and thus ensure their productivity, coastal water circulation can contribute to the reduction of beaches or erosion of the cliff coast; maritime traffic can lead to pollution in coastal areas, etc.).

2. Economic priority. Economic effects: interactions resulting from natural processes or land / sea use may generate (directly and / or indirectly) added value (such as revenue) and / or costs for specific economic activities or the economy as a whole (e.g. sea level rise) may cause floods and damage / loss of tourist infrastructure / housing leading to significant economic losses).

3. Social priority. Effects on society: added social values can be generated (e.g. job creation, local community development, social cohesion) or negative impacts (e.g. loss of local activities, professions, traditions; impact on economic sectors (e.g. reduction jobs, loss of orders, etc.).

- **Key Land-Sea Interactions due to socio-economic uses and activities are related to:** Water supply and sewerage, treatment facilities of coastal settlements and other urban areas; Coastal tourism, sports and leisure activities (e.g. bathing areas, tourist facilities, etc.).; Agriculture / irrigated agriculture, use of fertilizers and plant protection products /Urban sewerage; Port and shore protection facilities (dikes, walls, dams, etc.); Waste / wastewater disposal / septic tanks. **Key interactions due to natural processes are:** Coastal erosion (cliff erosion) and Hydrogeological instability (including landslides, screes, etc.).
- **Key Sea-Land Interactions due to socio-economic uses and activities are related to:** Hydraulic infrastructures (ports, marine facilities / coastal engineering / artificial reefs, breakwaters / groins, etc.); Aquaculture in the sea; Pollution (marine litter); Recreation and sports; Fishing, including bottom trawling; Marine protected areas, including Natura 2000 areas; Oil and gas extraction, oil and gas extraction infrastructures (offshore construction works, etc.). **Key interactions due to natural processes are:** Extreme sea events (sea storms, tsunamis, etc.) and Risks for coastal areas (coastal erosion, sea floods, intrusion of sea salt water, etc.).

Based on the identified key LSI and SLI, the main hot spot areas of LSI and SLI have been identified (see **Figure 12**). The study found that land to sea interactions are characterised by significant negative impacts. Most significant are the ones related to *Water supply and sewerage, treatment facilities of coastal settlements and other urban areas*; *Coastal tourism, waste/wastewater disposal and coastal erosion and landslides*. However, for the two sectors of marine protected areas and underwater cultural heritage (UCH) substantial positive effects were identified. Proper preservation of underwater heritage can be combined with sustainable touristic activities, expanding the traditional land-based offer. Tourism is also the main sector in the study area and has high-socio-economic priority as a source of revenues. Many of analysed sea to land interactions are also related to human activities resulted in having negative impacts. Most significant ones are those related to pollution (marine litter), fishing, including bottom trawling, coastal erosion and risks for coastal area (sea storms and floods). Marine litter is another issue that can be mentioned as example for the case study; although the marine litter is mainly generated by land-based activities, the interaction occurs also in the other direction (sea to land), as this peculiar form of pollution can affect the coastal environment and human activities in both directions.

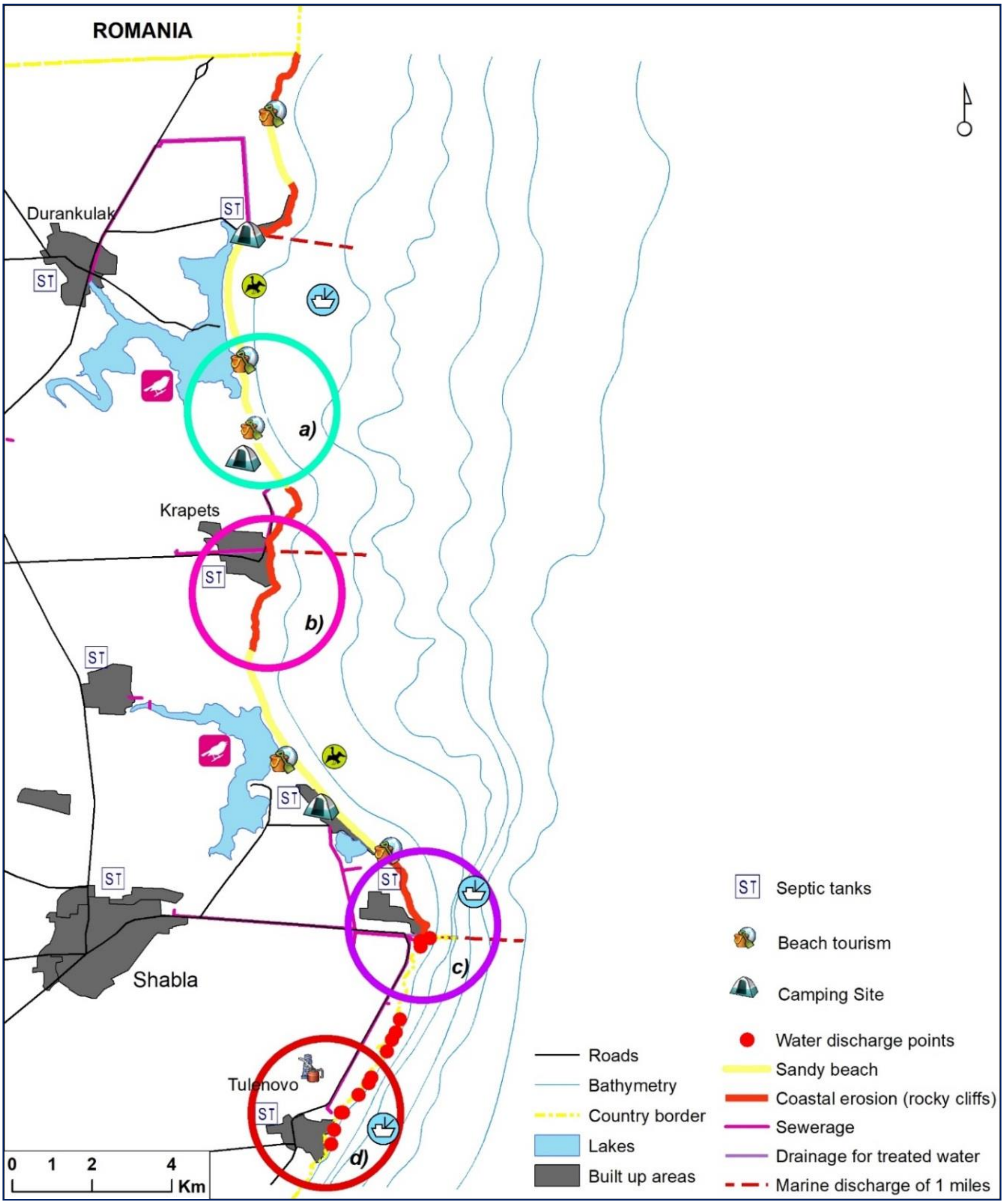


Figure 12 Identified hot spot LSI and SLI areas in the study area: **a)** Coastal tourism interacts with septic tanks, marine litter, protected areas, coastal erosion; **b**) Coastal erosion interacts with coastal tourism, septic tanks, MPAs, sewerage, agriculture; **c)** Water supply and sewerage, wastewater disposal, septic tanks interact with coastal tourism, fishing, MPAs, coastal tourism, cultural heritage, coastal protection; **d)** Oil extraction, discharge of untreated water and septic tanks interact with fishing, coastal tourism, scuba diving, MPAs (*Map produced by CCMS*).

The boundaries of the highlighted areas are approximate and absolutely not exhaustive in defining the LSI boundaries.

Specific focus of testing the methodology in the study area was coastal erosion. The case study was dedicated on the analysis of shoreline movement (at sandy beaches – erosion/accretion) and cliff retreat (at rocky coasts) using the Digital Shoreline Analysis System (DSAS) - version 5.0, an ArcGIS extension.

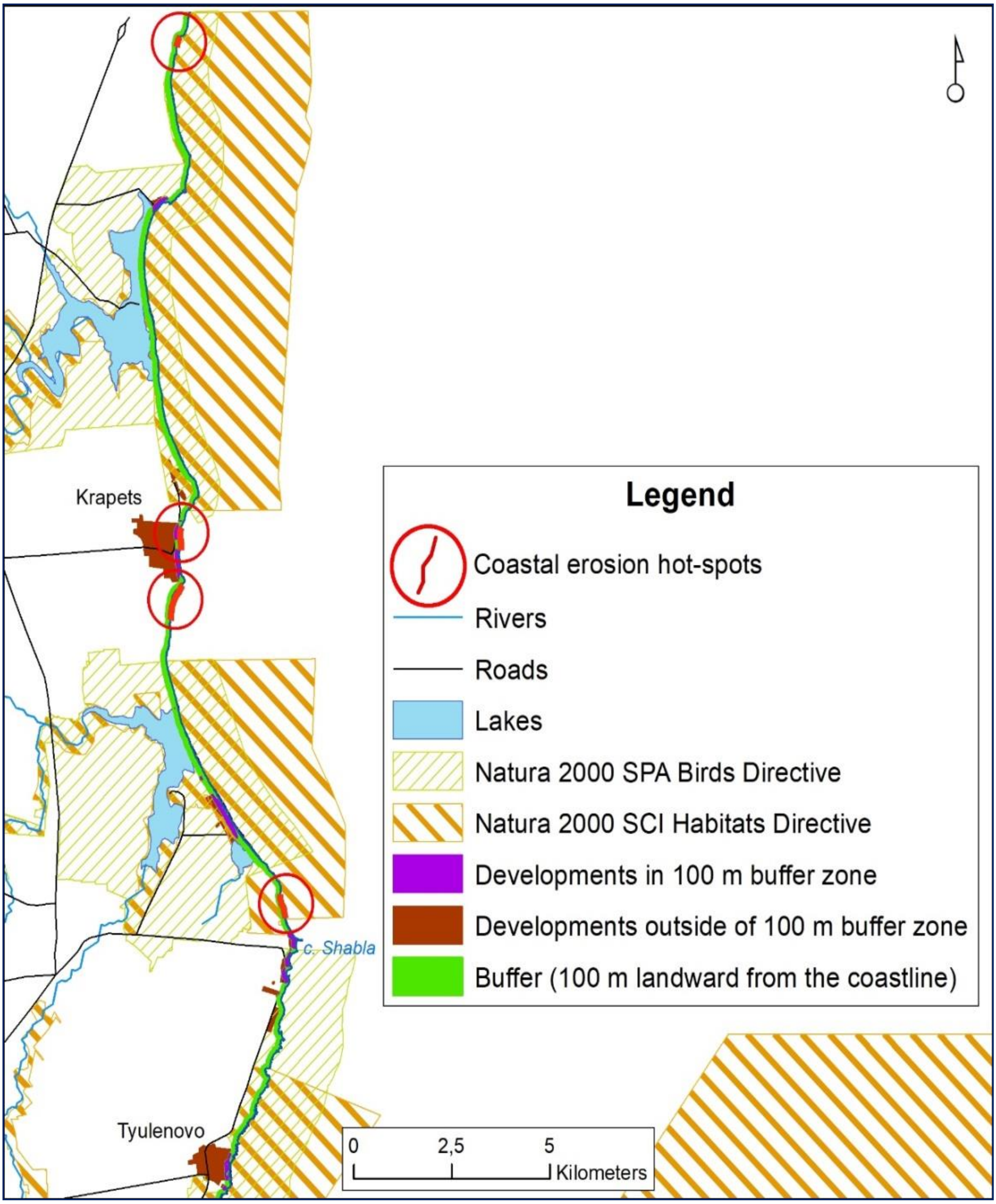


Figure 13 Coastal erosion (cliff retreat) hot spot sites in the study area
(Map developed by CCMS)

The cliff erosion hot spots with high priority were identified in Shabla study area and few strategy options to mitigate erosion impacts were recommended (see **Figure 13**). The fact, that the coast is low urbanised and developed, promote the implementation of more naturally oriented and soft measures. These options include measure's as 'do nothing' in portions with low coastal cliff retreated, or building submerged reefs in front of the most retreated coastal parts, or applying 'managed retreat'. Possible alternatives are for instance by including Nature-Based Solutions (NBS) in the coastal management as a way to reduce adverse impacts by creating healthy ecosystems and engaging nature and natural processes, providing a more sustainable, effective and cost efficient solution that is ecologically sound. It can be suggested that if there would not be newly developed hard coast-protection structures (as coastal dikes, rip-raps, sea walls), or other dramatic human influence on the coast, the future short and middle-term trends of positive shoreline movements (accretion) and cliff retreat rates will remain similar. Reducing or avoiding issues identified in this specific study on erosion rates using the most reliable data sets and applying appropriate approaches as DSAS is an essential process in developing a roadmap for the future coastal erosion and LSI management of the area.

Implementing a detailed monitoring programme to document and track the present location and condition of cliff and bluff edges, delineating armoured and unarmoured sections of coastline, and identifying erosion hazard zones will, over time, provide a more robust decision making [44].

Implementation of LSI methodology in Bulgaria has also identified **several key messages for integration of LSI in MSP**, mostly related to:

- Need for a better understanding and awareness of what LSI are - use the proposed LSI definition and consider all different dimensions in the conceptual framework of proposed LSI methodology.

- The available knowledge and information, and the capacity to use it, also need to develop further, so that the specific LSI issues can be understood both at a general, cross-border and local or place-specific level.

- More clarity in distinguishing LSI conflicts and synergies among uses and uses and environment are needed to better focus the analysis on the land-sea interface.

- MARSPLAN-BS II LSI analysis has provided many useful insights that can inform stakeholder engagement processes in MSP and more widely.

- Although MSP in Bulgaria has general and more centralised character, application of LSI methodology should be more case specific and locally focused with each coastal municipality.

- Adherence to other EU directives as MSFD and WFD, as well as to the European Green Deal (EGD)[56] and Sustainable Blue Economy Strategy[57] will also demand improved guidance and capacity building to raise LSI awareness.

- Ensuring a one 'planning continuum' is recommended, or the development of a 'One Space' territorial perspective should be encouraged to better address the relationship between land and sea (as found by MSP-LSI ESPON project).

[56] COM, 640 final, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, The European Green Deal, Brussels, 11.12.2019, COM (2019) 640 final.

[57] COM, 240 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on a new approach for a sustainable blue economy in the EU Transforming the EU's Blue Economy for a Sustainable Future, Brussels, 17.5.2021, COM(2021) 240 final.

Romania

A specific questionnaire is proposed, as a necessary for the field of maritime spatial planning related the interactions and impact of land-sea and sea-land. The key operational elements in the LSI approach include the two way perspective, showing:

- how terrestrial developments influence and support the marine developments and how they impact the environment, and
- how the sea supports or influences land activities. The ultimate goal is to ensure the well-being of coastal communities.

The identification of hotspot-specific areas for LSI (e.g. major port infrastructure, river input, coastal habitat for fish reproduction and growth of early larval stages, etc.) requires a detailed analysis, showing the cross-border dimension based on the common resources and activities sharing.

From a methodological point of view, the LSI analysis is performed in next stages:

- The **Preliminary phase** of analysis consists in identifying the most relevant LSI elements and taking into account all known interactions in the study area;
- **In-depth analysis phase** should be performed only for the most important interactions, selected in the Preliminary Phase;
- **The LSI analysis** is incorporated in the process of preparing national and cross-border MSP plans, within the implementation process of Directive 2014/89 / EU.

In this respect, public consultation and relevant authorities, as well as their identification, connection, information and mobilization (including at cross-border level) are essential in including their knowledge, opinions, needs, exchange of information, data collection, identification of gaps, conflict analysis, etc.

The questionnaire prepared to clarify these issues refers to the economic activities and natural phenomena and processes.

From a methodological point of view, for each maritime activity or natural process was necessary to establish the Ecological, Economic and Social Priority, or Impact using a numerical set from (3) to (0) to check how much give priority to the maritime field or marine process in question. The Priority can be Maximum (score 3), Average (score 2), Minimum (score 1). Score (0) corresponds to the situation where you consider that the field or the natural process is not a priority.

The proposed stakeholders acting in Romanian coastal zone were selected from the ones existent in the compound of NCCZ/the National Committee of the Coastal Zone, considering that in Romania the approach to LSI is not assimilated within MSP approaches, prevailing certain aims of Maritime Spaces Planning indistinct delineated, due to the fact: the Maritime Spatial Plan does not overlap with the Master Plans of Coastal Management and Coastal Protections, thus the interactions existent between the maritime space and its afferent coastal zone are inconsistent considered for the natural processes and, uses and activities, in both conducts of two ways, the land-sea and sea-land interactions.

The analyzed sample consisted of 53 entities, private and public entities from the entire coastal length. Data processing and obtaining the indicators used in the statistical description was performed using an exported results' *Excell sheet* of the SPSS program.

The analyses were developed in relation with the **key priorities** for Land-Sea and Sea-Land Interactions' main impacts, towards a qualification done relative to the three significant dimensions of sustainability: ***environmental, economic and social.*** Therefore, the evaluation of LSI was focused on the environmental, social and economic priorities, encompassing economic activities and natural processes at 'land' interacting with 'sea', considered from the stakeholders' expert opinion perspective, having as implicit certain suggested mitigation management from the key data identified.

- **Key Land-Sea Interactions due to natural processes are:** Soil erosion (under the action of wind and waves), Hydrogeological instability (including landslides), Transport of fluvial sediments, environmental degradation, floods (torrents), tectonic activities. The presence in the area of nominated coastal protected areas, designated at national level and Natura 2000 areas and natural resources (including water, minerals / quarries / etc.) have to be mentioned.

- **Key Land-Sea Interactions due to socio-economic uses and activities are related to**: Urban treatment plants, including those which collect polluted water from water bodies and waste water, disposal of waste and sewage (sewerage network / exhaust systems); Industry activities: Fishing in coastal lakes, Wind energy, Oil and gas extraction (in concession areas) and processing, Port activity, Rivers, roads, rail transport, Coastal tourism, Sports and recreational activities (tourist facilities, bathing areas, water sports, etc.), Military training areas and security.

- **Key Sea-Land Interactions due to natural processes and presssures, are:** Extreme sea events (sea storms, tsunamis, etc.); Risks for coastal areas (coastal erosion, sea floods, sea level rise, intrusion of sea salt water, etc.); Marine Protected Areas (MPAs) designated at national or European level - Natura 2000; Algal blooms, Eutrophication, Seismic events.

- **Key Sea-Land Interactions due to socio-economic uses and activities are related to:** Marine fishing (including bottom trawling); Infrastructures related to the Romanian coast (ports, civil works of maritime / coastal engineering / artificial reefs, submerged dams, embankments, perpendicular or parallels to the shore, etc.); Submarine cables and pipelines; Dredging and storage of materials; Maritime transports; Marine tourism (yachting, rides with different boats, cruises), Recreation and sport activities; Marine Defense and Security (including military training areas); Pollution (marine litter, maritime waste from navies transport).

The general evaluation of the seaward pondered (land-based) interactions in the whole Romanian coastal area shows that the environment is mainly reflected as a principal priority, but also for the ecological impact were considered as main landward (sea-based) influences of the marine natural environment, as well offshore related to maritime activities. Between the identified activities (21 Land-Sea and 19 Sea-Land) have been established interrelations: conflicts and synergies:

Also, several responding entities gives emphasis to that, the interactions existent between the maritime space and its afferent coastal zone are inconsistent concerning the natural processes, uses and activities, in both conducts of two ways, the land-sea and sea-land interactions.Both LSI interaction were pass through a number of criteria to be identified to delimitate the area of LSI analysis, using a semi-qualitative scale, considering LSI ‘*functional scope*’depends on physical characteristics, human activities and natural and anthropogenic processes, as well as on the governance aspects.

Taking into account the questionnaires, public consultation and interviews results, registered only in the Romanian transboundary area, Mangalia-Vama Veche, near Bulgarian border could be underlined the following aspects, threats / findings and possible solutions identified.

Conclusions concerning the ecological problems, environment protection, biodiversity conservation in Mangalia study area:

Main features ecountered in the Mangalia study area			Public Perception concerning priorities		
Identified issus	**Threats / Findings**	**Possible solutions**	**Ecologic**	**Economic**	**Social**
Existence of strictly protected areas and areas of protection (including Natura 2000)	- Projects for sand nourrishment and beach areas restoring - Presence of the port proximity - Existence of the landfill - Erosion (near MU of May 2)	- Legislative issues solving - Small area sandy nourishment in May 2 - Regulation of approvals obtaining - Macrophyte algae valorization for agriculture, biogas, etc.	92.2%	27.5%	39.2%
Macrophyte Algae stocks presented on the coast	Discomfort caused to tourists	Collection and valorisation of stocks for fertilizer and biogas	60.8%	52.9%	41.2%
Erosion in the Saturn - Venus area	The plan is to demolish dams and to sandy nourish in their place. This lead to an ecological disaster, because in the area were identified a rocky substrate with high specifical biodiversity	Sanding the area of Saturn - Venus will comply with the provisions of the Environmental Agreement and the approvals/opinions of the protected areas custodians	27.5%	45.1%	39.2%
Coastal Erosion in front of 2 Mai - MU (Military Unit)	High cliffs collapse due to rain seepage	Cliff consolidation project	64.7%	56.9%	39.2%
Seisms risks			13.7%	54.9%	66.7%
Waters	Risk in case of flooding or spillage activities	Good water management to fight agains floodings	66.7%	80.4%	74.5%
Seafront area between Vama Veche and 2 Mai	In danger of downfall	Hydrotechnical Areas strictly protected	72.5%	29.4%	66.7%
Accidental Pollution	There are not threats registered, yet	- The necessity of control - The necessity to increase the degree of local factors involvement	92.2%	68.6%	82.4%
Fishing activities and stocks	Possible to be under coastal and maritime activities impact: freshening, marine litter, waste discharge, pollution, ships traffick	- Control, Monitoring - Mitigation	45.1%	39.2%	
***Rapana venosa* collection**	The bottom trawl using for the the of *Rapana venosa* harvesting it is a real threat	- Manual harvesting with divers is allowed and encouraged	-	-	-
Reef with *Cystoseira barbata*	The reef is threatened to be destroy by the sanding works, proposed by ABADL	Sanding nourishment takes into account the found reef and - having an enclave shape, submerged dams will built (aspects specified in the Notice of NIMRD)	-	-	-
Social aspects related fisheries	Possible conflict between fishermen and the Coast Guard	Good legislation and ANPA regulations take the new coordinates sent by NIMRD	-	-	-
Shipwreck area	Avoiding zone	UCH Areas strictly protected	-	-	-
Presence of wrecks or mines	- Legality issues concerning the information that may become public - Underwater Areas of military trainings with damage	A study approved by the Ministry of Defense should also be included in the methodology	-	-	-

Main features ecountered in the Mangalia study area			Public Perception %		
Identified issus	**Threats / Findings**	**Possible solutions**	**Ecologic**	**Economic**	**Social**
Fishing	- Areas for traditional fishing are limited and restricted - Anchoring areas are not always respected - Conflict between the fishing and tourist/sky jet leisure areas - Insufficient beacons - Examples of good practices: official approovals/notices for fishing traditional boats	- Management plans respecting - Protected areas respecting - Possible redelineation of the nets fishing area - Simplifying the system and procedures for obtaining authorizations - Possible development of aquaculture, mainly in terrestrial zone	56.9%	58.8%	35.3%
Fishing	Possible over-exploiting of the fish resources	If the specific legislation and the ban orders and notices given by the areas custodians are respected, there is no problem	56.9%,	51.0%	33.3%
Santierul naval					
Portul turistic			70.6%	74.5%	56.9%
Economic activities	- In conflicts with oceanographic research: - Socio-economic area possible affected by the presence of EXON in the concession areas for drilling and routes already prepared	The risks will be taken into account when permits formalities are approved	56.9%	70.6%	62.7%
	- Training districts presence for drilling rigs - Liquefied gas terminals - Bitumen, cement produce contaminated sediments - Sanding nourishment works	- Harmonization of navigation restrictions that may affect the economic zone - Compliance with port safety regulations	74.5%	72.5%	% 43.1%
Tourism	- Interference with traditional fishing activities - Tourist activity is often perceived as a "pressure" on the area - Sanding and restoration projects are related with the beach areas	Inclusion of the Tourism Carrying Capacity (TCC) Method with the involvement of tourism stakeholders	62.7%	66.7%	52.9%
Urban new districts/areas					
Mangalia Sewage Treatment Plant	Potential for pollution with discharges/wastes waters	Following the analyzes performed by the Public Health Directorate, no problems / contaminations were found, yet	86.3%	64.7%	72.5%
Sewage Treatment Plant of Vama Veche and 2 Mai resorts	- Possible to have incorrect connection to the Mangalia treatment plant - Potential for pollution with discharges/wastes waters	- Vama Veche si 2 Mai locations are connected to the sewerage network, domestic and treated water in Mangalia Station - According to the Public Health Directorate analyzes no contamination problems were found.	80.4%	64.7%	70.6%
Landfill	Potential for pollution with water and domestic waste / spills / infiltrations	The condition is unknown, but no big problem has been identified so far	92.2%	31.4%	66.7%
Military areas			25.5%	15.7%	35.3%
The presence of pipes near the MU-military unit from May 2	The rain can activate the impact	No leaks were detected till present			

7. Overall conclusions and the way forward

LSI involve complex interrelationships between natural, socio-economic, and governance factors and should be considered in the MSP planning as to the requirements of the EU MSP Directive. Climate change has also an increased impact on the LSI and should be properly addressed in the national planning. Yet, there is no widely recognised and accepted definition of LSI, rather than a number of useful examples and results (including mostly EU studies and project efforts) that can be capitalised and taken into account. The European experience in projects focused on LSI have shown that there is still no **'one size fits all'** approach to address and analyse these complex interactions between land and sea (and vice versa) in the context of MSP, and to establish governance arrangements and systems to manage LSI [3,8,26]. The selected approach depends on the differences in physical and socio-economic conditions, and on the policy questions to respond to different administrative and legislative frameworks, and planning systems.

Another important issue is that LSI have multiple dimensions and a single sector LSI approach would only cover part of the complex LSI [8]: the LSI issues have both environmental and socio-economic dimensions, and each of these dimensions has different geographical and temporal implications. Thus, the complexity of LSI requires planners and developers to apply a multi-sectoral approach and to cover multiple spatial scales. In addition, the LSI needs to be considered and managed in both directions across the land-sea interface [26].

There are a number of mechanisms and approaches which may facilitate integration in the context of land-sea interface (including territorial planning, ICZM (if exist), MSP, or even developing one holistic plan for LSI). Here, the overlap of national MSP with municipal coastal planning is emphasised as ensuring a 'one planning continuum' [8,26]. On the other hand, coherent integrative coastal and marine governance relies on enhanced awareness of the interconnections and dynamics between land and sea and their appropriate inclusion in planning and management processes. As PanBaltic Scope project identified it might be too late or too early to fully implement a national and cross-border LSI perspective as a central feature in the present round of MSPs of the EU MS [8]. This in particular is related to the countries as Bulgaria and Romania that have been just starting their MSP, as the time is not sufficient to fully integrate this perspective in the present stage of planning. Still, this MSP round could prepare for deeper future coordination and integration across the land-sea boundary, and also across countries in the Black Sea.

Although the legislation suggests an integrated approach for MSP, the extent to which this is actually operationalised in practice is limited. In Bulgaria, the territorial and sea planning do not have a specifically formalised approach to analyse LSI. The national approach to MSP aims at a systems perspective, aware that most uses also can imply LSI aspects. Even though the division of planning mandates across the land-sea continuum is established, the overlapping planning system still causes confusion over responsibilities for LSI. It is also challenging to find the right way to consider LSI and decide how deeply it should be embedded in the land and sea planning/ MSP framework. We conclude that MSP should seek to more actively connect and collaborate to land-based planning, using projects as an entry point in discussions with land use planners and using the MSP process as an opportunity for joint learning.

MARSPLAN-BS-II developed a common LSI framework, a definition and a methodology, which could be used as starting points of considering LSI as further iteration models along the entire Bulgarian and Romanian coasts/maritime space and at cross-border/transboundary context. This approach reflects the cross-border focus of MARSPLAN-BS II for countries less experienced in MSP and working with actual LSI challenges in a problem based manner.

The suggested methodological approach to LSI was piloted in the Bulgarian - Romanian cross-border area (Shabla Municipality and Mangalia Municiplaity) at local administrative level (but also involving regional and national contexts). The proposed method provides a way of stepping into the LSI complexity in a structured and focused way, allowing recommendations for the good management of LSI to be developed in the national MSPs. These recommendations can be used in the next rounds of implementation and monitoring stages of the MSP process in Bulgaria and Romania.

Implementation of LSI methodology in the cross-border area of Bulgaria and Romania provided many useful insights that can inform stakeholder engagement processes in MSP and more widely. In countries that have not dealt in MSP before, there is a particular opportunity to develop an LSI mindset with the relevant stakeholders [8]. The results from implementing the LSI methodology reveals that a good governance of LSI requires effective horizontal and vertical integration, involving not only key governmental stakeholders, but also private and civil society stakeholders, and their trust should be kept for the next rounds of the MSP process.

Although MSP in Bulgaria has a general and more centralised character, application of LSI should be more case specific and locally focused with each coastal municipality. As many activities have direct or indirect impacts on coastal areas, closer collaboration between Competent MSP Authorities and coastal municipalities (territorial planning) is needed to promote sustainable and ecologically effective uses on land and at sea, especially for those with implications across the land-sea boundary.

Looking to the future, as advocated by the ESPON MSP-LSI project [26] the development of a **'One Space'** territorial perspective should be encouraged to better address the relationship between land and sea. Alternatively, stronger links between MSP and land-based planning (coastal municipalities) or ICZM can result in one space planning. This may even include establishing a dedicated integrated instrument or competent authority for managing the LSI interactions or developing one holistic plan for the land-sea interface.

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WP2, ACTIVITY 2.3: INTEGRATION OF LAND-SEA INTERACTIONS (LSI) IN MSP FOR THE CROSS-BORDER REGION

DELIVERABLE 1:
METHODOLOGY FOR ANALYSIS AND INTEGRATION OF LAND-SEA INTERACTIONS IN THE CROSS-BORDER MSP