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INTEGRATION OF LAND-SEA INTERACTIONS (LSI) UNDER MSP FOR THE CROSS-BORDER REGION (ROMANIA)

December 2021

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Cross border Maritime Spatial Planning for Black Sea Bulgaria and Romania - MARSPLAN-BS II

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QUESTIONNAIRE IN THE FIELD OF MARITIME SPATIAL PLANNING (MSP) IN THE VIEW OF THE BI-REDIRECTIONAL RELATIONSHIP ESTABLISHMENT LAND - SEA INTERRACTION (LSI):

SHORE-SEA AND SEA-SHORE

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List of Acronyms:

EASME – Executive Agency for Small d Medium-sized Enterprises
CINEA - European Climate, Infrastructure and Environment Executive Agency
EU – European Union
EUNIS – European Nature Information System
GVA – Gross Value Added
LSI – Land-Sea Interactions
MPAs – Marine Protected Areas
MSFD – Marine Strategy Framework Directive
MSP – Maritime Spatial Planning
MS – Member States
NGOs – Non-Governmental Organisations
NM – Nautical Mile
NUTS – Nomenclature of Territorial Units for Statistics
SCI – Sites of Community Importance
SPAs – Special Protected Areas
UCH – Underwater Cultural Heritage
ICZM - Integrated Coastal Zone Management
NCCZ - National Committee of Coastal Zone
MEWF – Ministry of Environment, Waters and Forests
MDPWA – Ministry of Develoment, Public Works and Administration
UOC – *Ovidius* University Constanta
NIMRD – National Institute for Marine Research and Development „Grigore Antipa"
GeoEcoMar – NIRD – Marine Geology and Geoecology
SPSS - Statistical Package for the Social Sciences

1. Introduction

The European Maritime Spatial Planning Directive 2014/89 / EU, currently being implemented in the member countries, including Romania, by Law 88 of 2017, exclusively promotes Maritime Spatial Planning. It was decided that in this EU Directive a major importance should be given to Land/Sea Interactions (LSI) especially for the elaboration of the National Maritime Spactial Plan and for the elaboration of scenarios for rational, sustainable development of maritime activities in a harmonious way with the marine environment.

A requirement of the MSP Directive (2014/89 / EU) is that EU Member States (MS) to take LSI into account when they are preparing their maritime spatial plans.

Human activities and natural processes interact in a complex way in the sea-coast and coast-sea interface areas, such as:

- The terrestrial component of the maritime transport sector, represented by ports areas and channels,
- Coastal developments and economic activities (e.g. marine fishing - discharge areas; tourism, beach, leisure-recreation; mining, oil and gas extraction-collected areas, processing plants, transport ways, etc.), recovery or extension of the lands with major anthropogenic impact on the coastal and shallow marine environment, direct and/or indirect influences on the sea;
- Coastal erosion caused by a kind of climate instability (strong currents, waves, meteorological events, etc.) with impacts in both directions on the interference zone: erosion, accretion, equilibrium areas;
- Eutrophication, marine algal blooms that have terrestrial causes, different discharges, effluents, solid natural transport, sedimentology; Danube impact, etc.

Integration between the planning of the marine and terrestrial spaces is important and can only be achieved through policy coherence, plans and decisions. Therefore, the MSP Domain aims to manage the maritime dimension of coastal activities and their impact, by:

- an integrated and strategic vision,
- a coherence between land/terrestrial use planning and marine planning,
- aligning LSI with Integrated Coastal Zone Management (ICZM) within MSP.

LSI Concept encounters problems because of different gaps in information and knowledge for specific issues and especially those regarding state and private ownership of the groung which are not really delineated; and because of multi-levels and multi-sectoral processes. LSI, as a component of MSP, is not just about identifying specific LSI issues. It links land and maritime planning issues, authorities and their ability to govern maritime space at national and cross-border level. One more important mention comes from the ICZM concept, developed in Romania under the ICZM Law 202/2002 (in present in updating) under the MEWF and NCCZ.

The MARSPLAN-BS II Project explores the possibilities of identifying and analysing the important aspects of LSI on the Romanian coast, in the Black Sea, in the cross-border region of Bulgaria and Romania.

In relation to the available data, methods, plans and processes aiming to identify important challenges and barriers, are also achieved the integration of LSI in MSP at national level, to be included in the specific LSI cross-border level as part of LSI methodology for the Black Sea.

A specific questionnaire is proposed, to be necessary for the field of LSI under the maritime spatial planning by taking into account the interactions and the impact of both land to sea and of the sea to land, as two key operational elements included in the LSI approach, namely:

- The Assessment from land to sea: showing how terrestrial developments influence and support the marine developments and how is the impact on the environment, and
- The Assessment from sea to land: showing how the sea supports or influences land activities.

The first and also ultimate goal is to ensure the well-being of coastal communities.

2. Methodology

According to international recommendation and practices[1] and CCMS recommendation in Romania was elaborated a questionaire, spread to a large list of stakeholders belonging to coastal and maritime institutions, authorities, companies, communities, from the governmental to local level. Stakeholders answers, data and information were collected by UOC, on an *Excell sheet* of the SPSS program

Results are importanta for the cross-border dimension because maritime areas share common resources and activities. 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.

From a methodological point of view, the LSI analysis includes some well-known stages:

- The **Preliminary Phase** of analysis consists in identifying the most relevant LSI elements 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.
- The proposed stakeholder 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 not consistent considered for the natural processes and, uses and activities, in both directions of two-ways, the land-sea and sea-land interactions.

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 includes the two components related to (1) Shore-to-sea impact interactions and (2) Sea-to-land interactions. They also refer to economic activities and natural phenomena and processes.

[1] https://maritime-spatial-planning.ec.europa.eu/sites/default/files/land_sea_interactions.pdf

From a methodological point of view, for each maritime activity or natural process it was necessary to establish the *ecological, economic and social priority*, or the *ecological, economic and social impact* using a numerical set from (3) to (0) which must be checked depending on how much give priority to the maritime field or marine process in question. In this sense, 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.

We asked stakeholders to rate each priority and check a number of 42 and to choose an option. For those who not know the issue under discussion or cannot answer, it was the the option - Priority "*I do not know / I do not answer"*. (N). It was estimated, in this way, the extent to which maritime activities and marine processes has an ecological, economic or social priority.

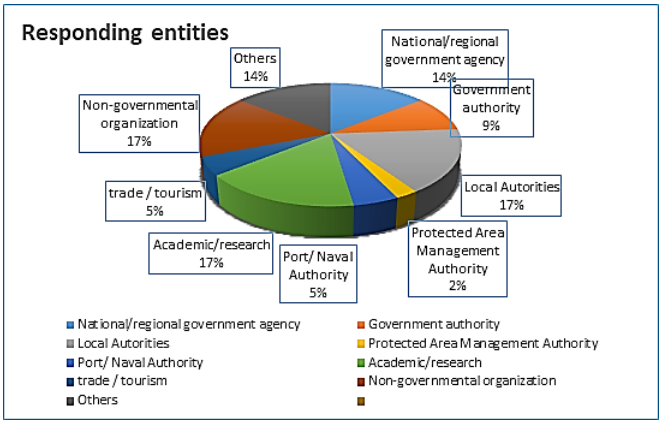


Figure 1. Responding entities (Figure 3)

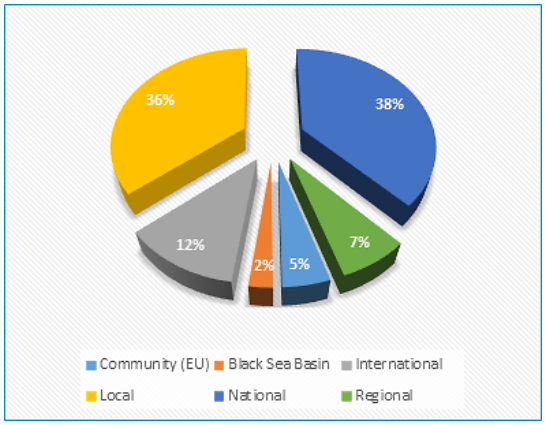


Figure 2. The institutional scale (Figure 4)

The analyzed sample consisted of 42 answers, from private and public entities of 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. It could be more answers in non-pandemia conditions.

The analysis-based results of a Land-Sea Interactions series of questionnaire were conducted using a descriptive and exploratory methods. The questionnaire, which was addressed to stakeholders grouped in public and private entities, outlined several aspects regarding Land-Sea Interaction.

- **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 and marine 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 dams 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 shipping waste);

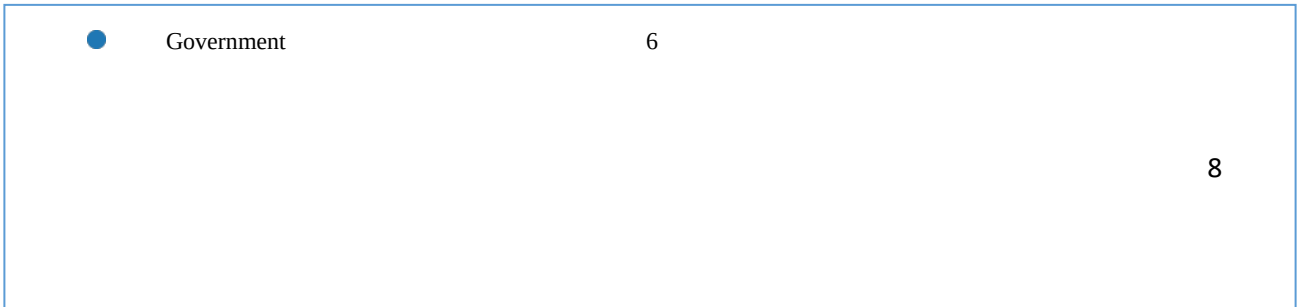
The general assessment of the pondered seaward (land-based) interactions in the entire coastal area of Romania shows that the environment is mainly reflected as a main priority, but also for the ecological impact were considered as the main terrestrial/landward (sea-based) influences of the marine natural environment, as well as offshore related to maritime activities. Several responding entities also point out that the interactions between the maritime area and its afferent coastal area are inconsistent in terms of natural processes, uses and activities, in both bidirectional ways, the land-sea and sea-land interactions.

3. The LSI questionnaire

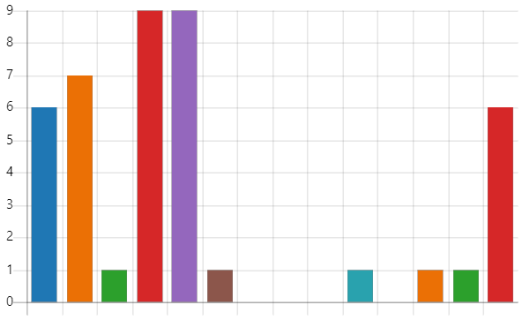
The questionnaire was design in three parts. After the first part, the information section, the second one is Interactions LAND – SEA and the third Interactions SEA – LAND questions:

I. INFORMATION SECTION

1) **Name and surname of the interviewer (optional):** Figure 1, 2
2) **Organization (name and address):** Governmental and Local authorities, National Governmental Agencies, State-owned Companies, Naval-Port Authority, Universities, Danube - Black Sea Basin Authority, Utilities Providers (water, energy), Chamber of Commerce, Tourism, Research Institutions, NGOs, Public transport company, Security services and protection, Cultural organization, etc.
3) **Title/position within the organization:** representatives of nominated institutions
4) **Contact details (tel, e-mail):** list of stakeholders
5) **Sector of activity** (Figure 3)

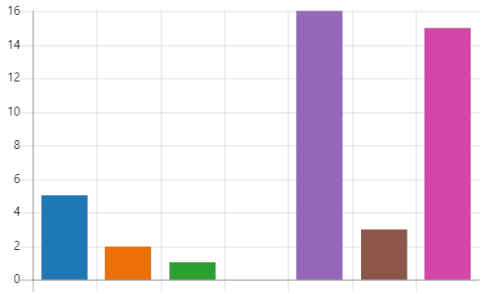


Administrative	7
Cultural	1
Research and Development/Academic	9
Environment	9
Tourism/Recreational	1
Fishing/Aquaculture	0
Exploration and exploitation of resources	0
Unconventional Energy	0
Port activities	1
Transport maritime	0
Constructions/ hydrotechnical works	1
Defense	1
Other	6



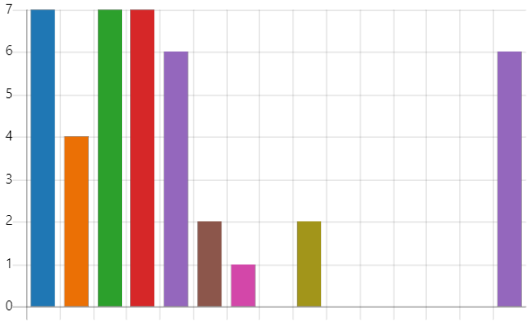
6) The scale at which the organization's activity is carried out (Figure 4)

International	5
Community (EU)	2
Basin	1
Sub-basin	0
National	16
Regional	3
Local	15



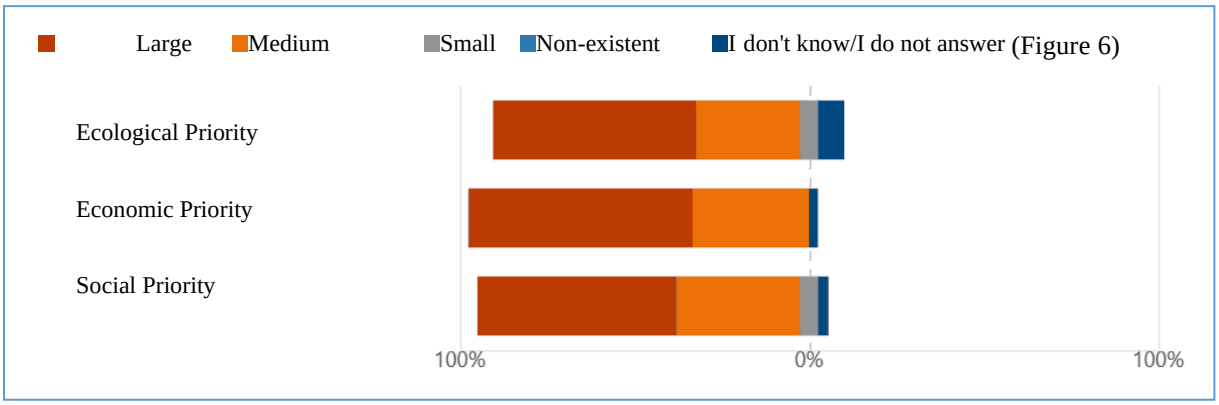
7) Type of organization (Figure 5)

University/Institute of Research	7
Government authority	4
Local authority	7
Non-Government Organization	7
National Government Agency	6
Authority Por Naval	2
Managing Authority Ar.	1
Basin Authority, entity	0
Chamber of Commerce/Tourism	2
Public transport company	0
Security services and protection	0
Utilities Providers (water, energy)	0
Cultural organization	0
State-owned company	0
Other	6



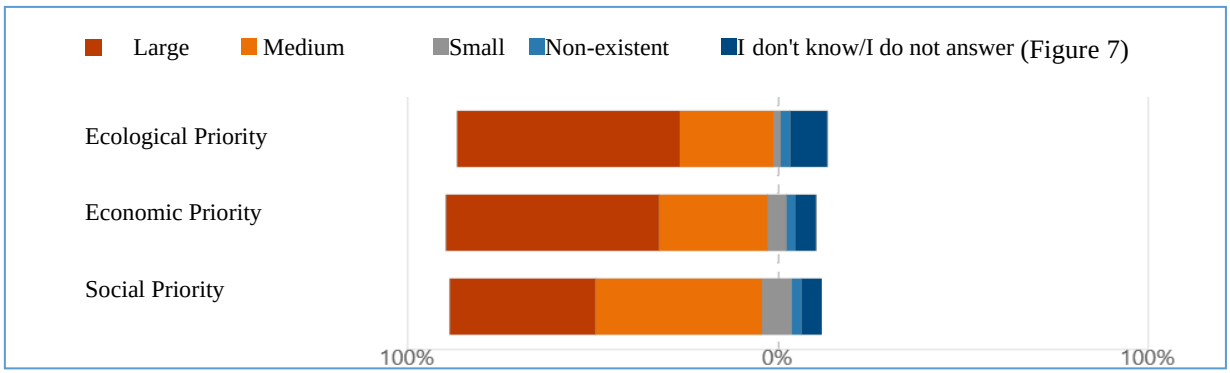
II. Interactions LAND - SEA

8) Marine Fishing is considered, to be:



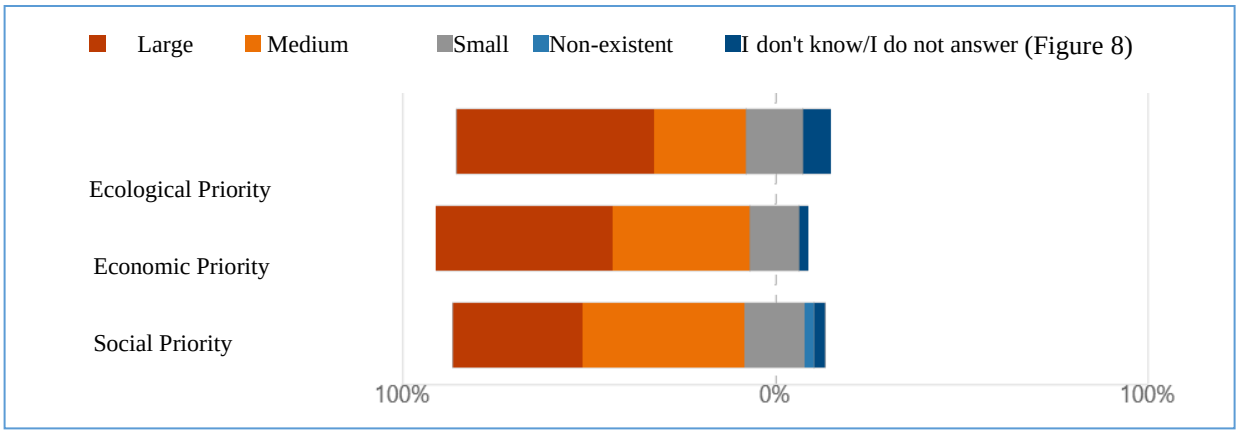
(Figure 6)

9) Coastal and lagoon aquaculture is considered to be:



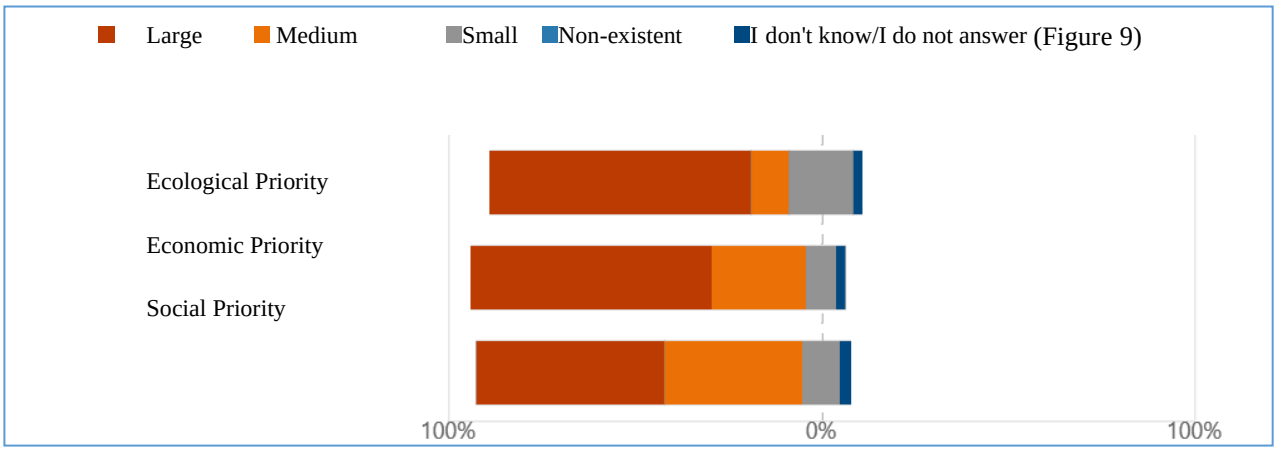
(Figure 7)

10) Fishing in the coastal lakes, is considered to be:



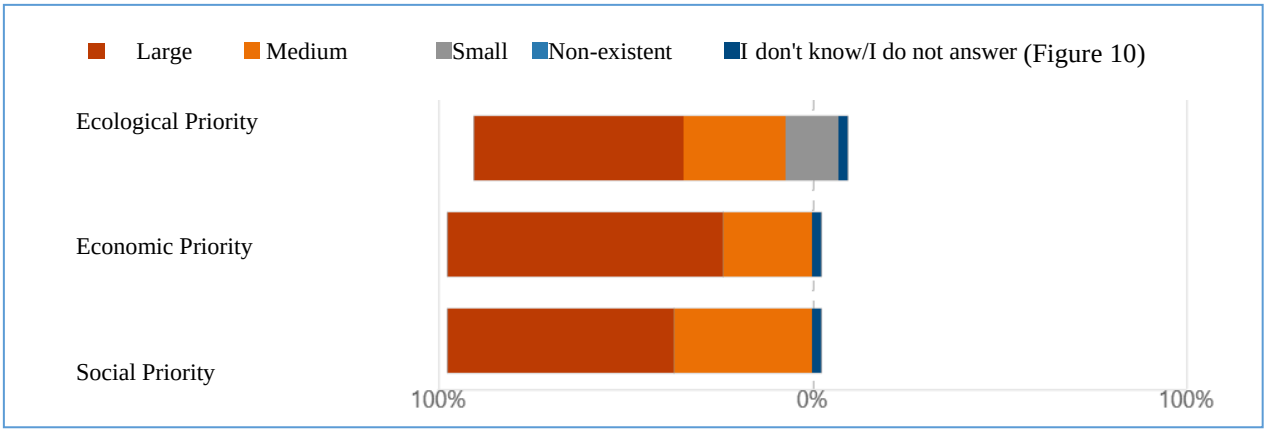
(Figure 8)

11) Natural resources use (water, minerals/quarries/etc), **is considered to be**:



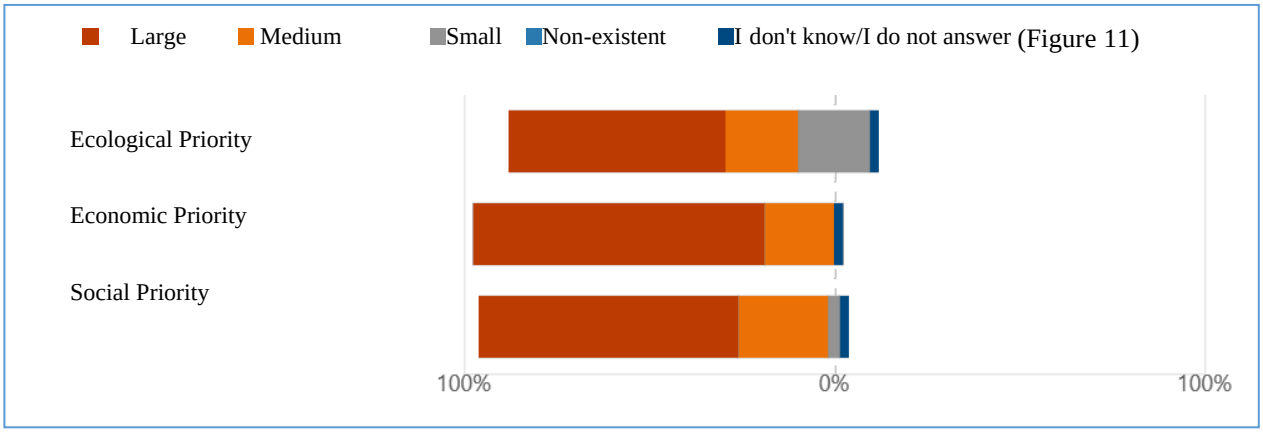
(Figure 9)

12) Agriculture and Animal Farming, are considered to be:



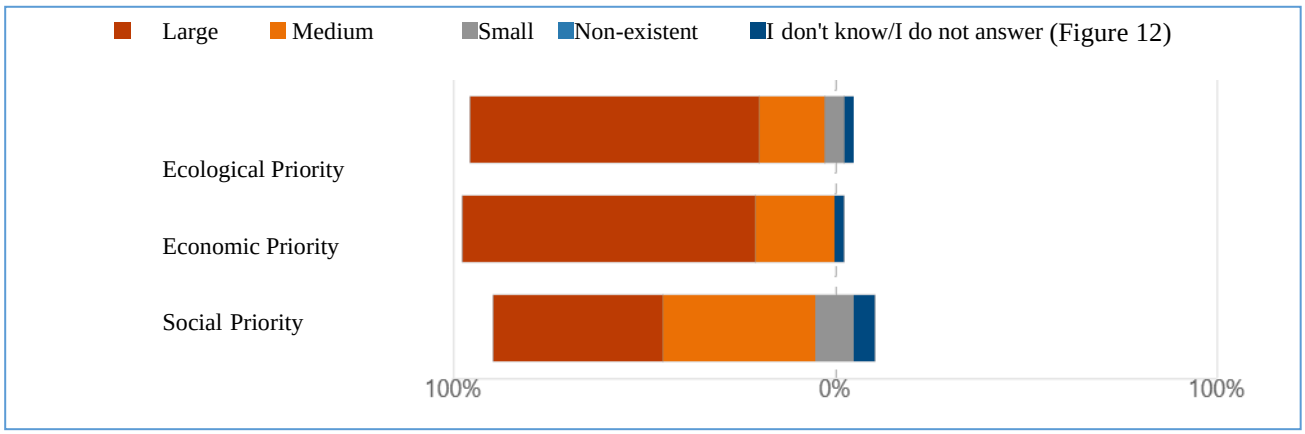
(Figure 10)

13) Industrial activity, is considered to be:

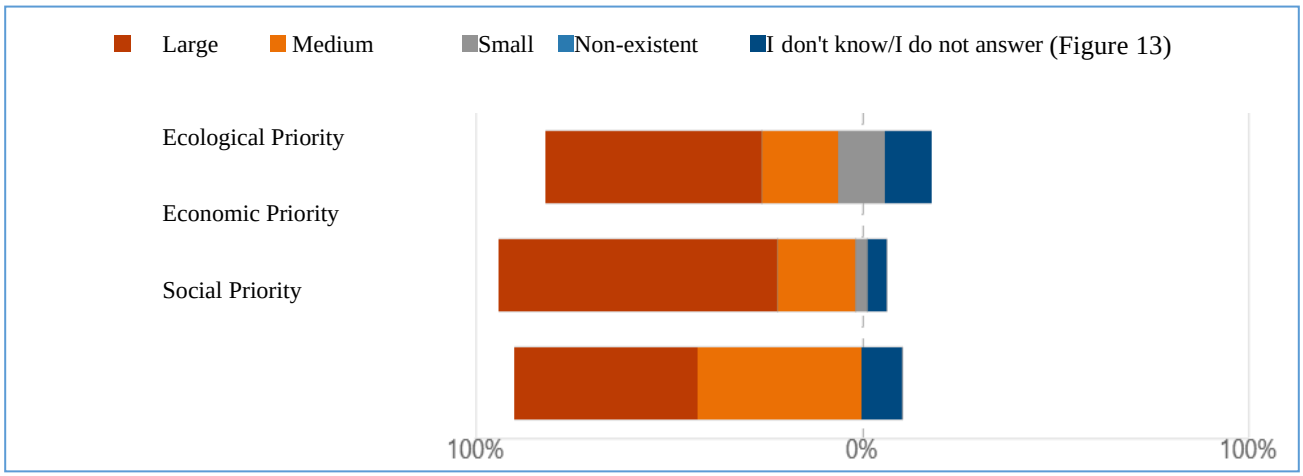


(Figure 11)

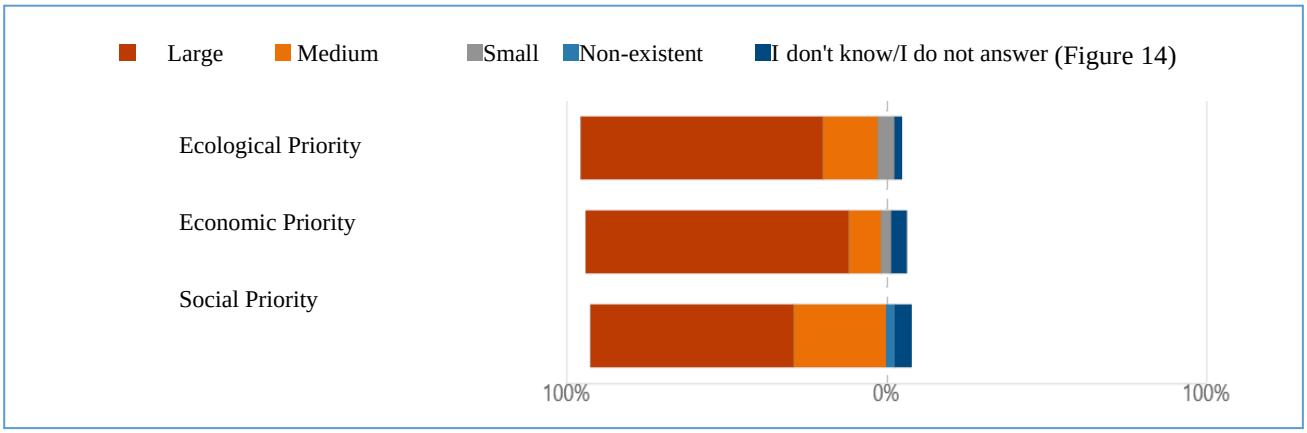
14) Energy industry (renewable energy, wind, etc.), **is considered to be:**



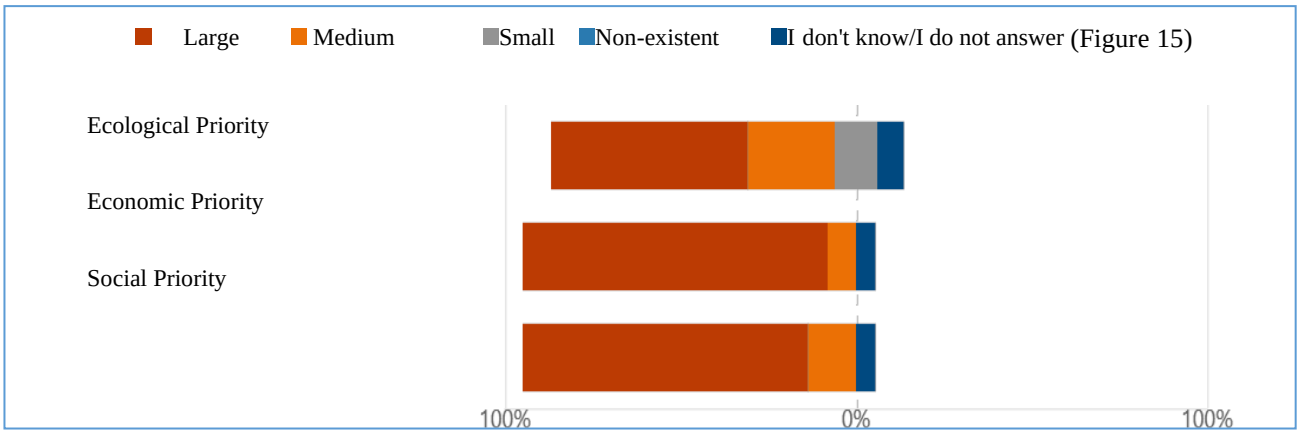
15) Extraction of oil and gas (in concession areas**) is considered to be:**



16) Port Activity and coastal protection (dams) are considered to be:

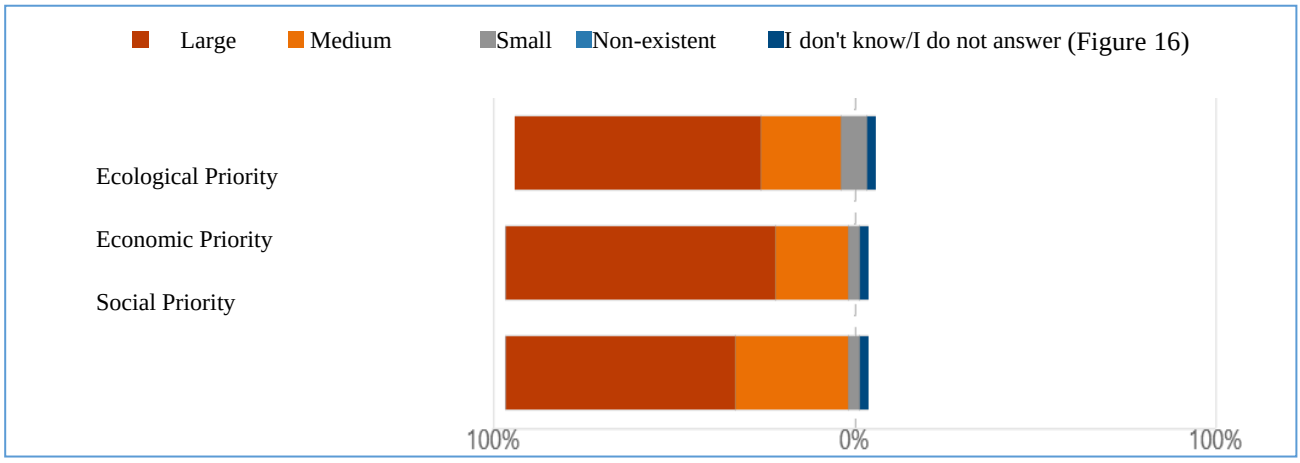


17) River, roads, rail transport are considered to be:



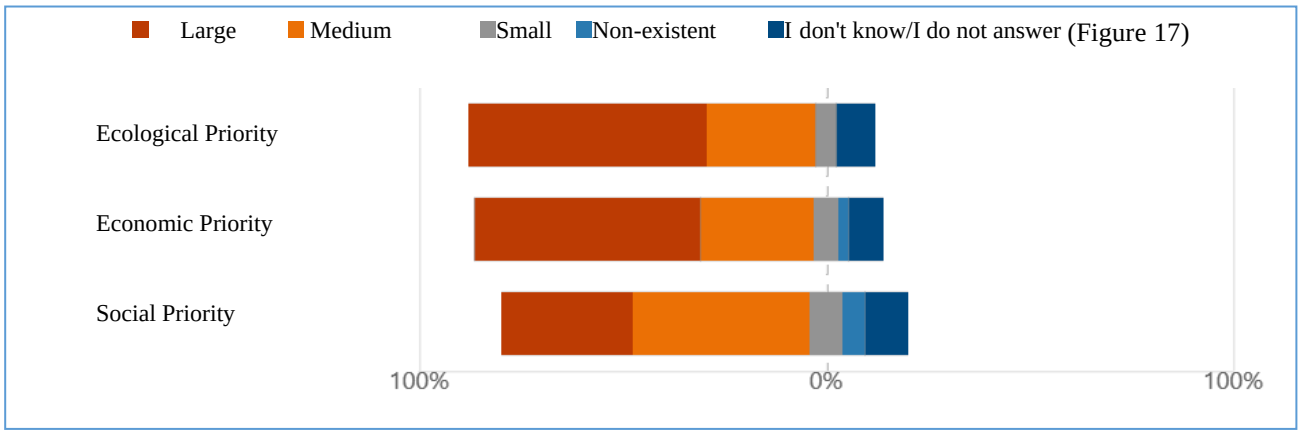
(Figure 15)

18) Coastal and marine tourism, sports, and recreational activities (including facilities touristic, bathing areas, water sports, etc.**) are considered to be:**



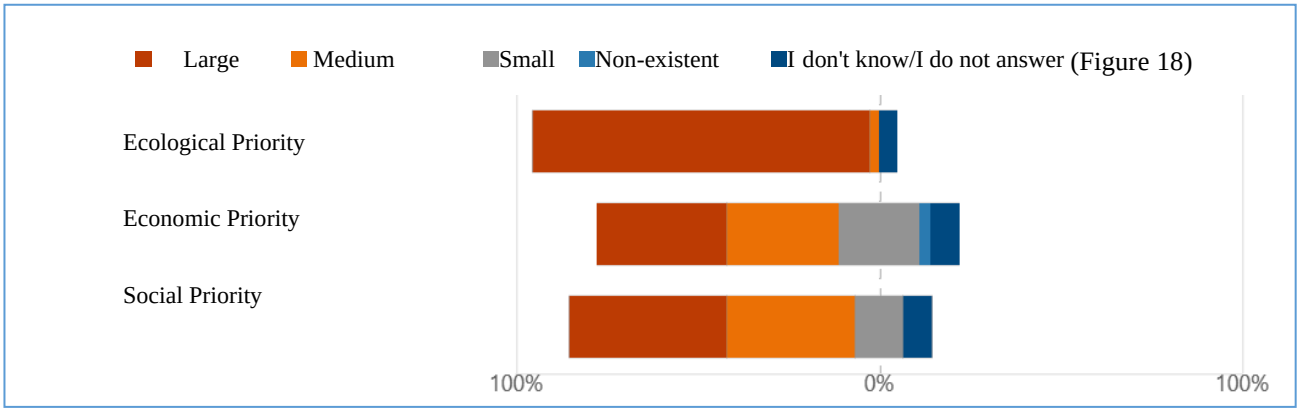
(Figure 16)

19) Biotechnologies for the sea space are considered to be:



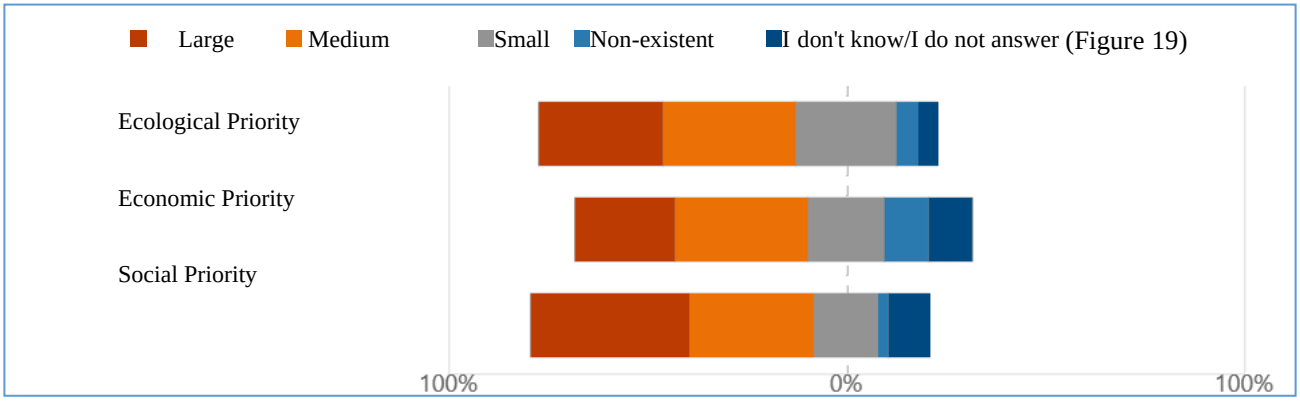
(Figure 17)

20) The extention of Coastal protected areas, designated at national level, and areas Natura 2000 (nature reserves, national parks, regional parks, etc.) **from the shore area or from the sea, are consider to be:**



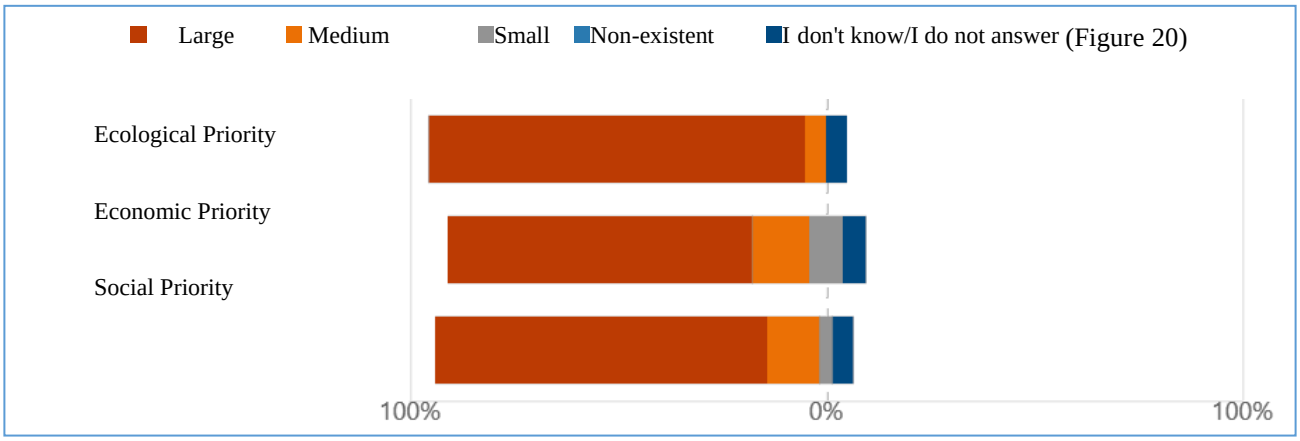
(Figure 18)

21) Defense (Military Training) and Security Areas are considered to have:



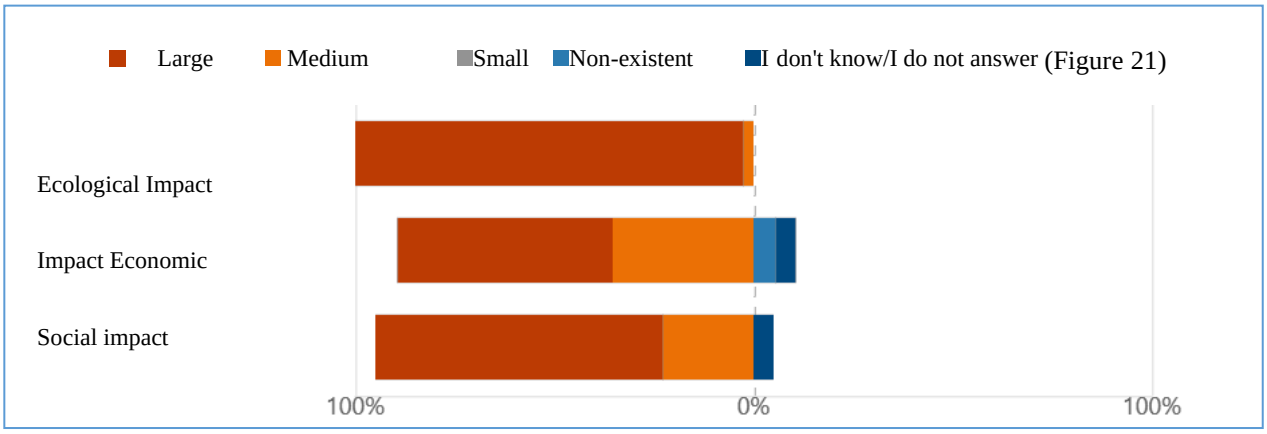
(Figure 19)

22) Urban treatment plants, including those that collect polluted water from water bodies and wastewater are considered to be:

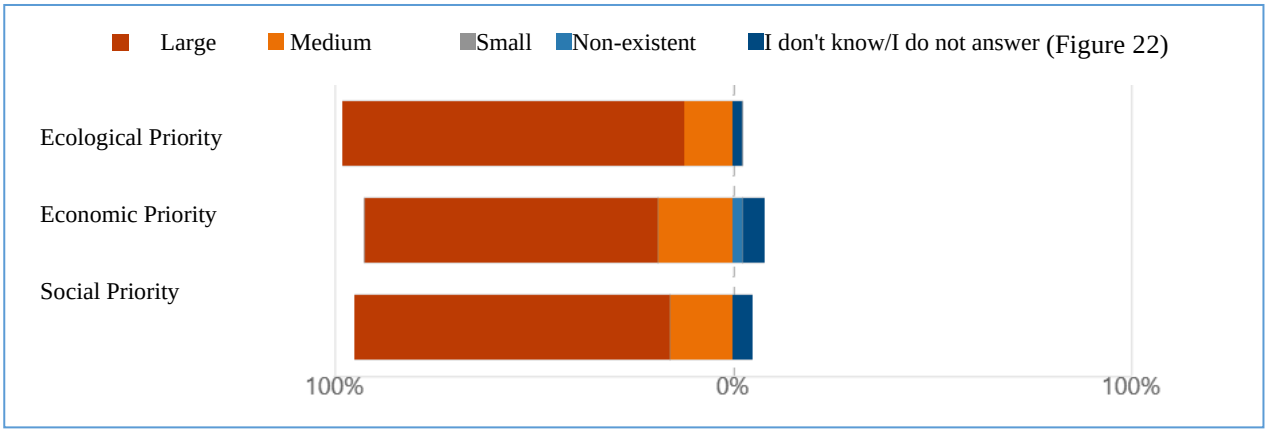


(Figure 20)

23) Discharge of residues and wastewater extention is considered to have:

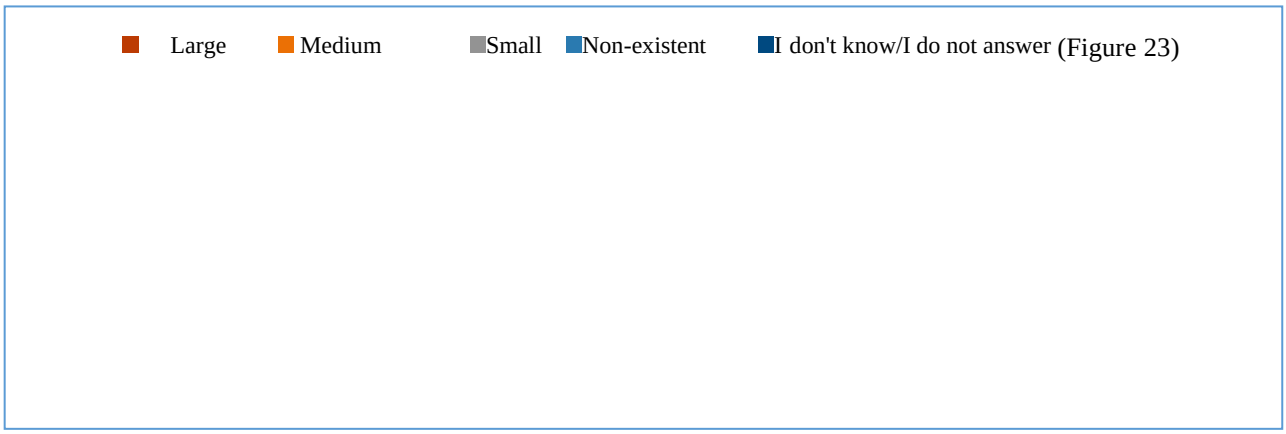


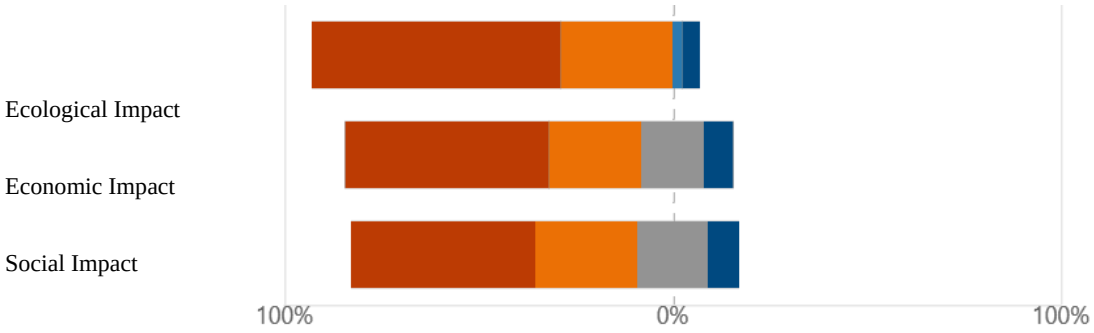
24) Sewerage reveal / exhaust systems is considered to be:



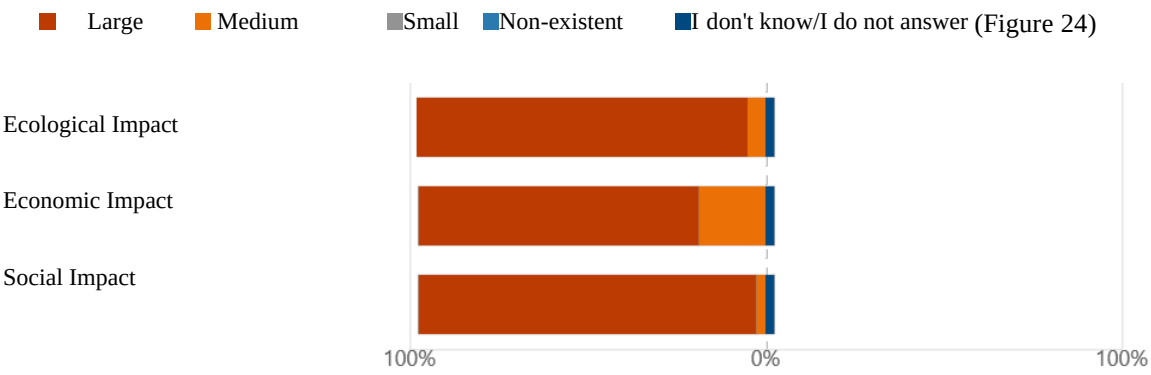
III. Interactions SEA –LAND

25) Soil erosion extention (under the action of the wind**) is considered to have:**



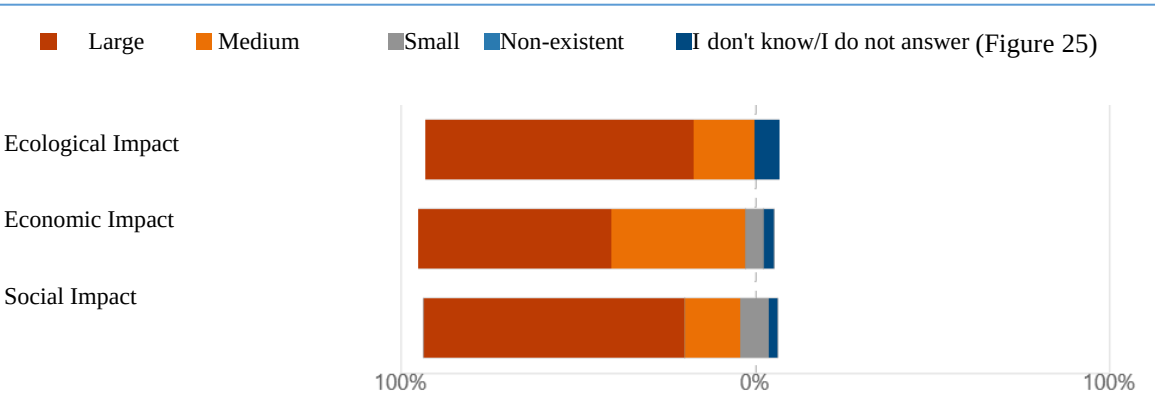


26) Environmental degradation extention is considered to have:



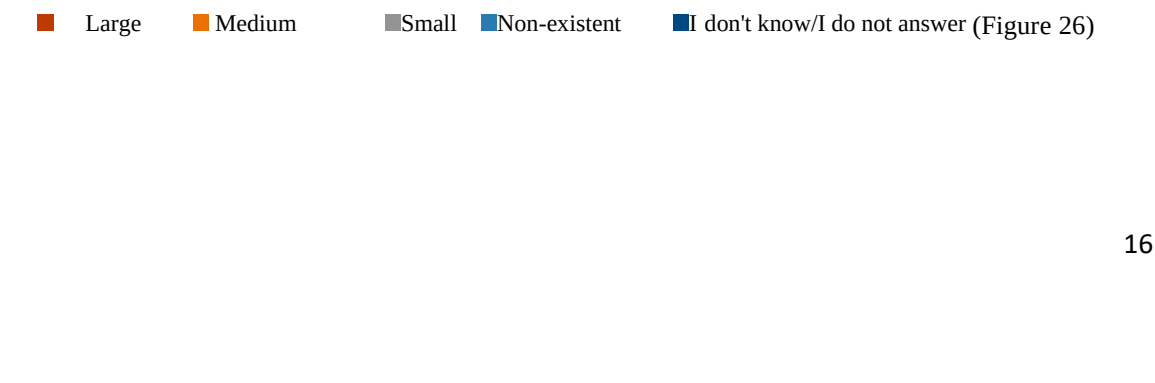
(Figure 24)

27) Hydrogeological instability extention (including landslides**) is consider to have:**

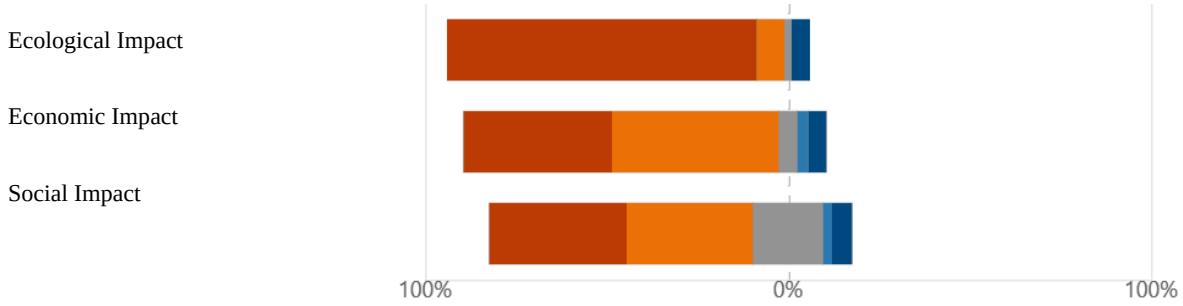


(Figure 25)

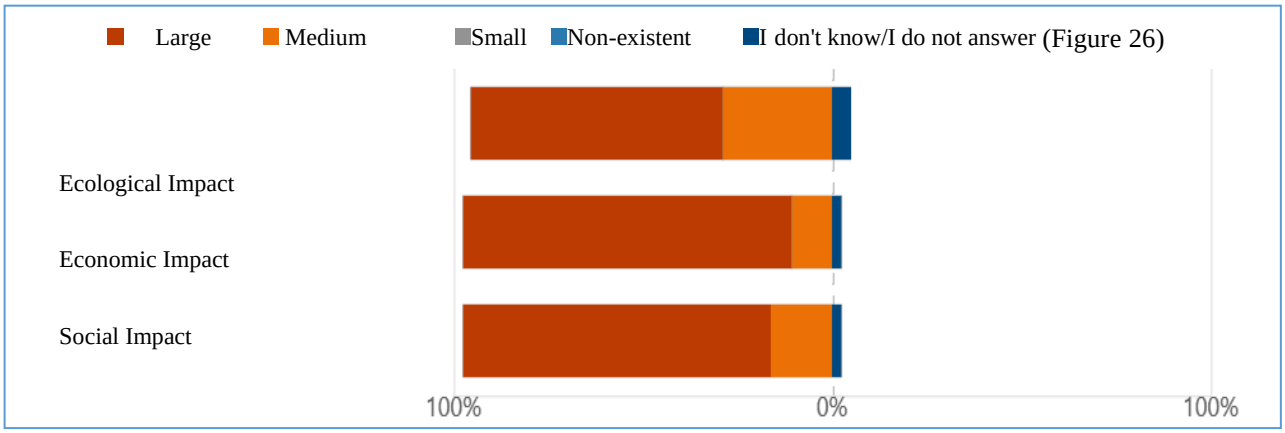
28) Transport of river sediments extention is considered to have:



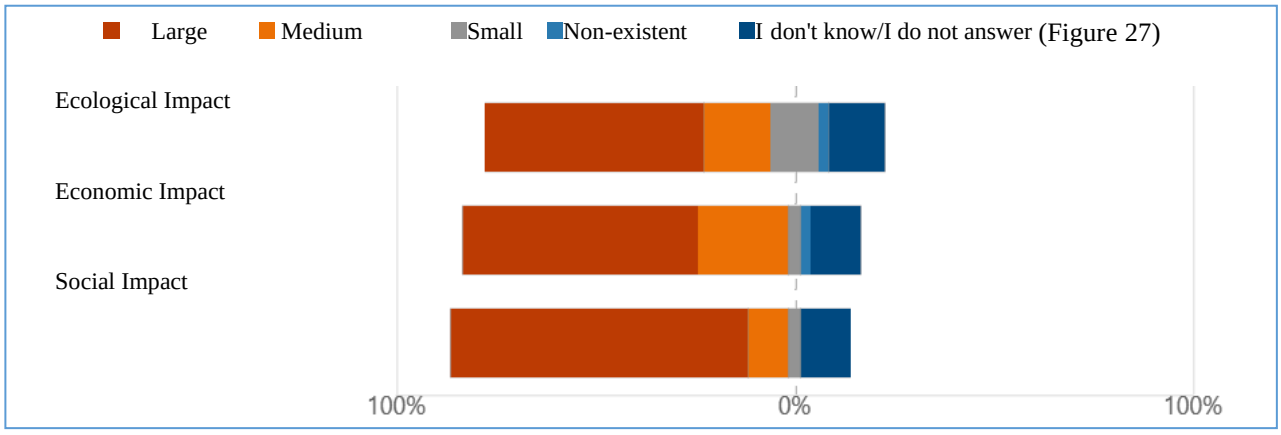
(Figure 26)



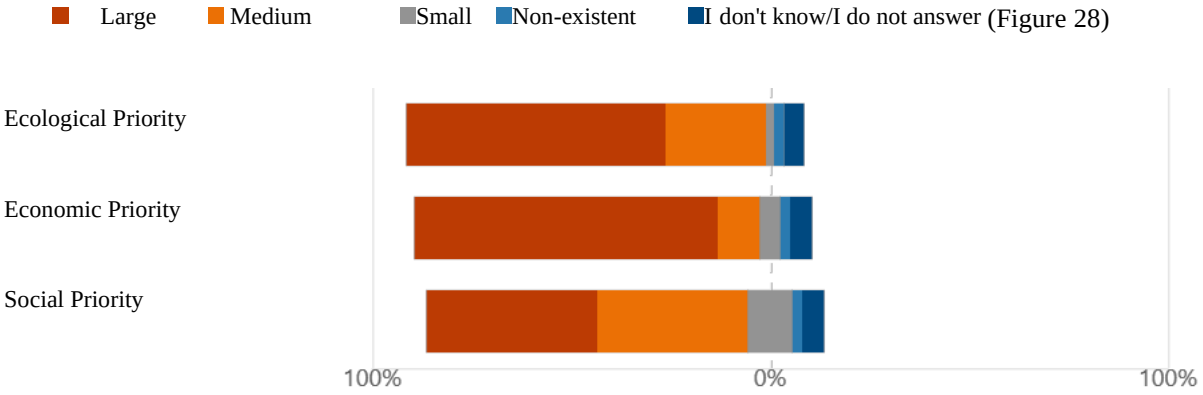
29) Floods extention is considered to have:



30) Tectonic Activities extention is considered to have:

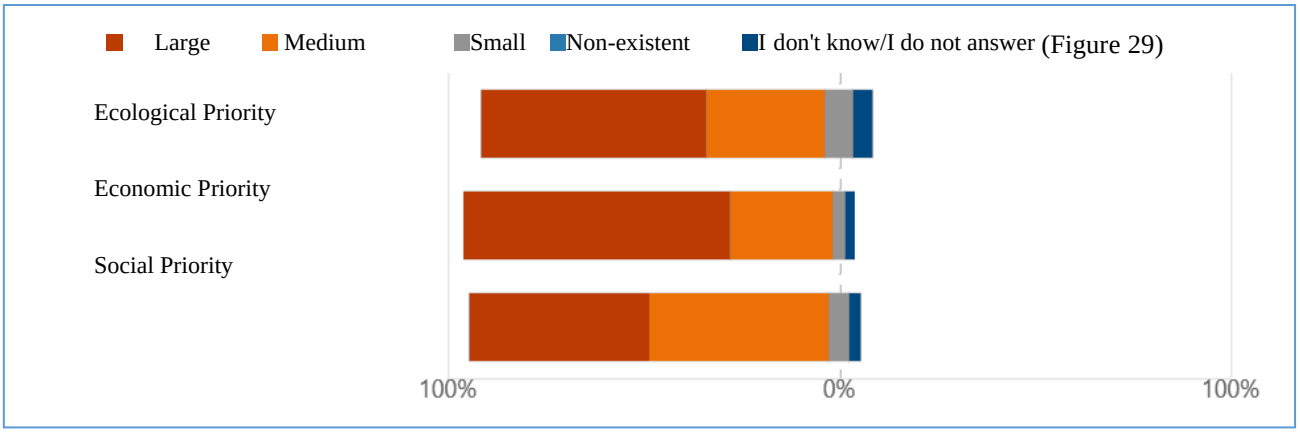


31) Seawater Aquaculture / Mariculture is considered to be:



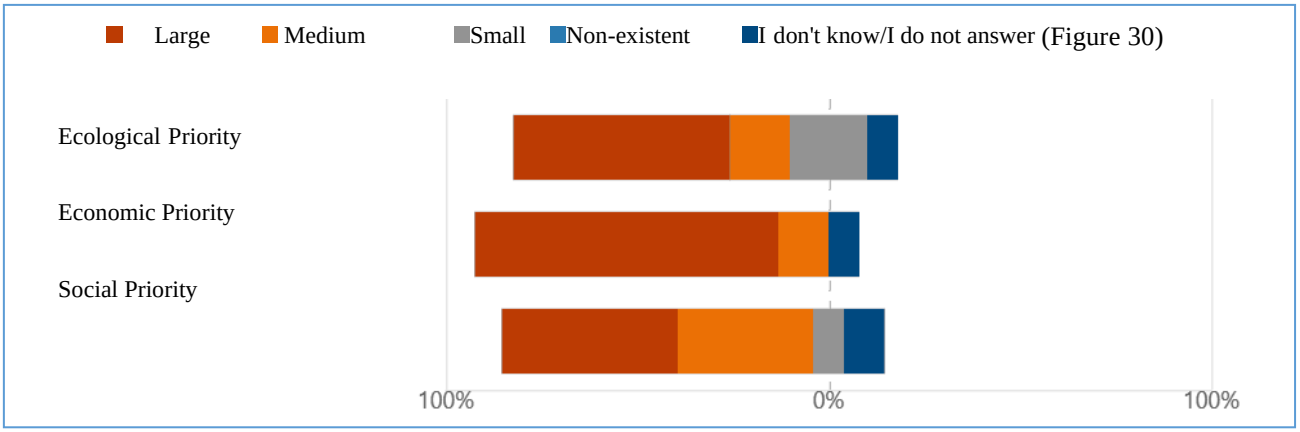
(Figure 28)

32) Marine fishing is considered to be:



(Figure 29)

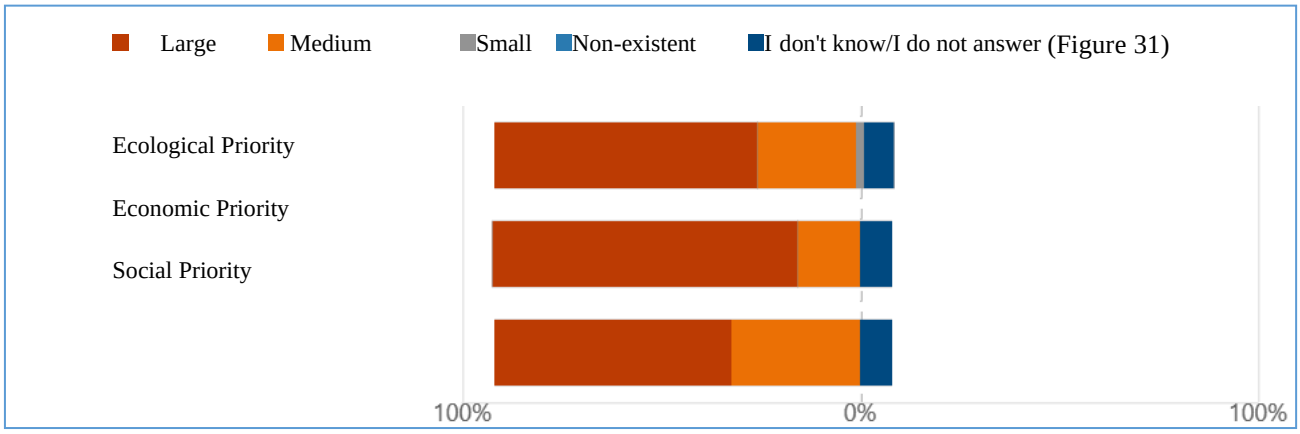
33) Extraction of oil and gas from the sea is considered to be:



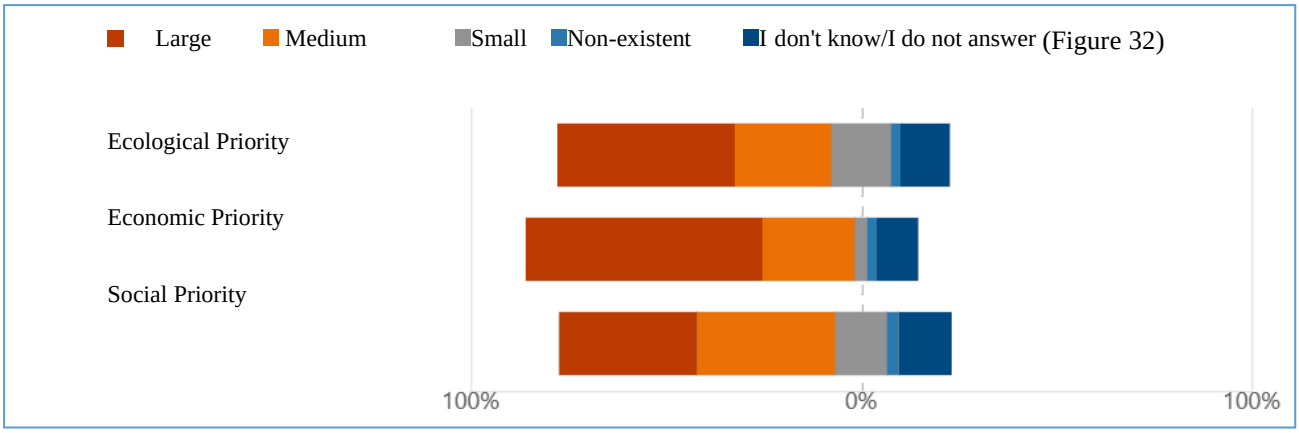
(Figure 30)

34) Infrastructures extention of the Romanian seaside (ports, civil works of maritime

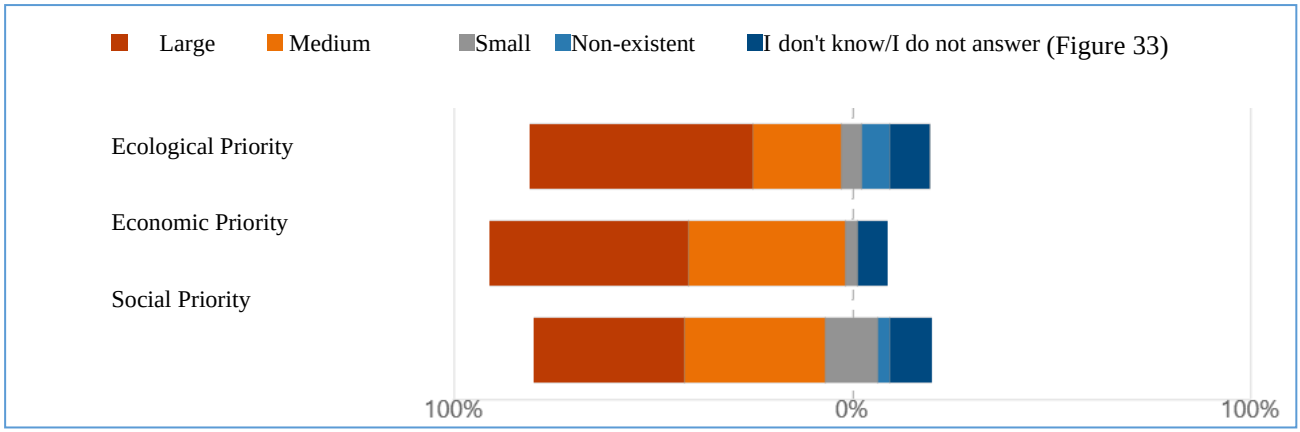
engineering / coastal/artificial reefs, submerged dykes, emerged, perpendicular to the shore, parallel, etc.**) is considered to be:**



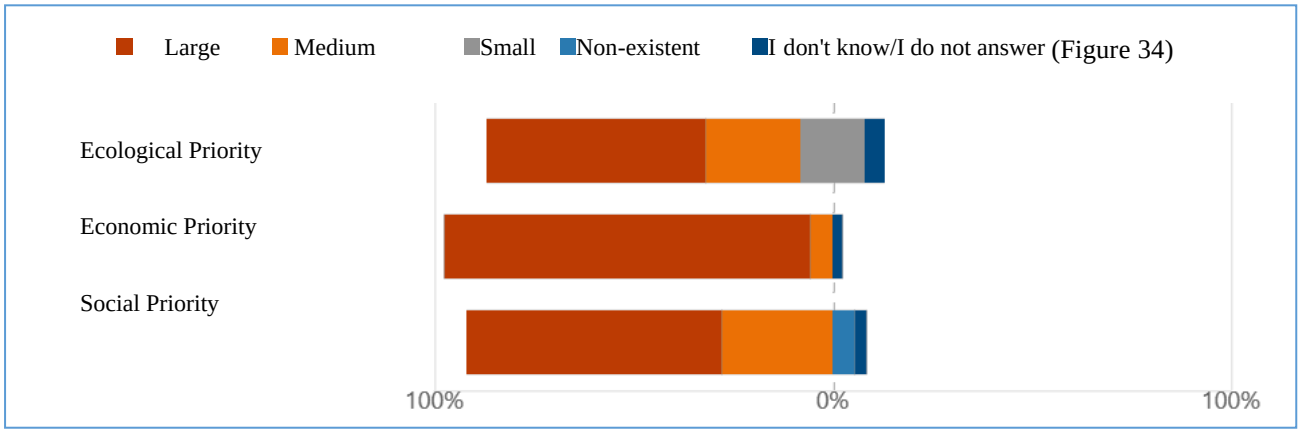
35) Submarine cables and pipes extention are considered to be:



36) Maritime activities relating to dredging and storage of materials extention is considered to be:

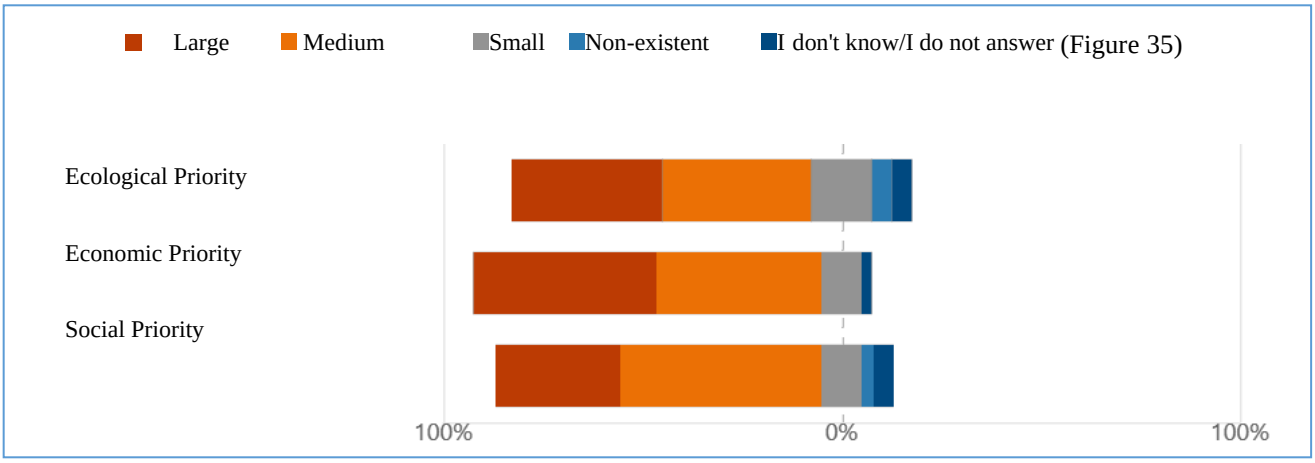


37) Sea ports extention is considered to be:



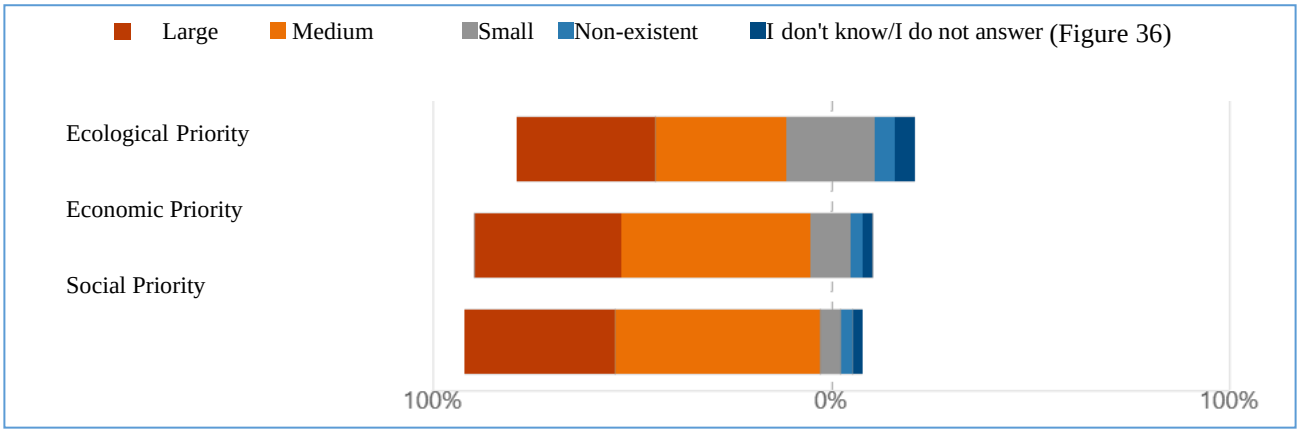
(Figure 34)

38) Maritime Tourism extention (yachting, boat rides, cruises**) is considered to be:**



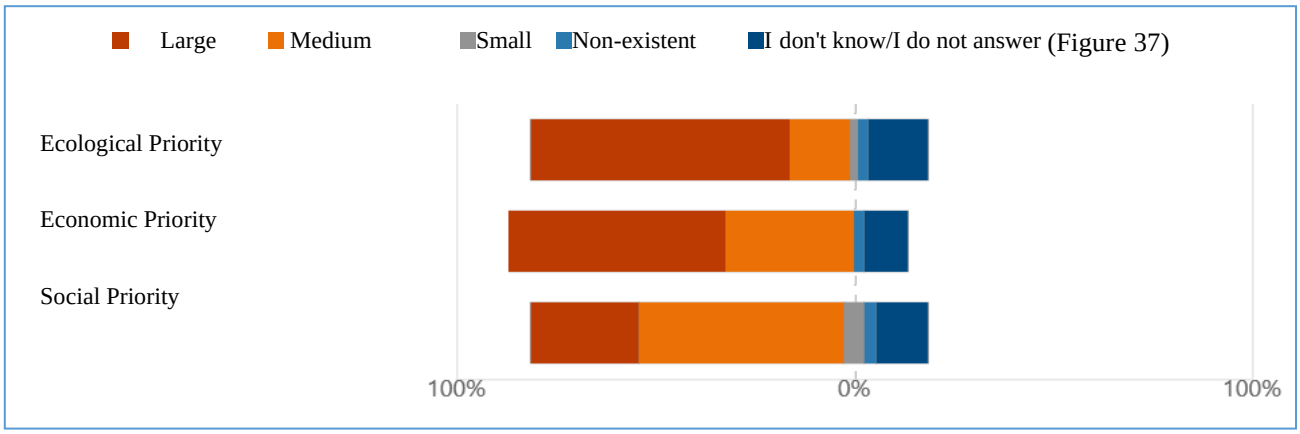
(Figure 35)

39) Maritime recreational and sporting activities extention is considered to be:

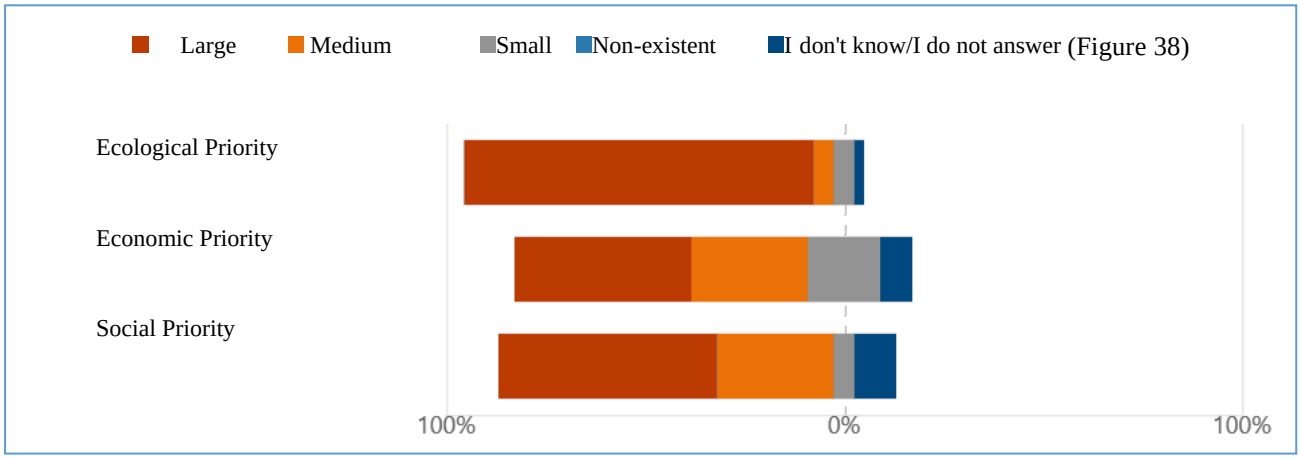


(Figure 36)

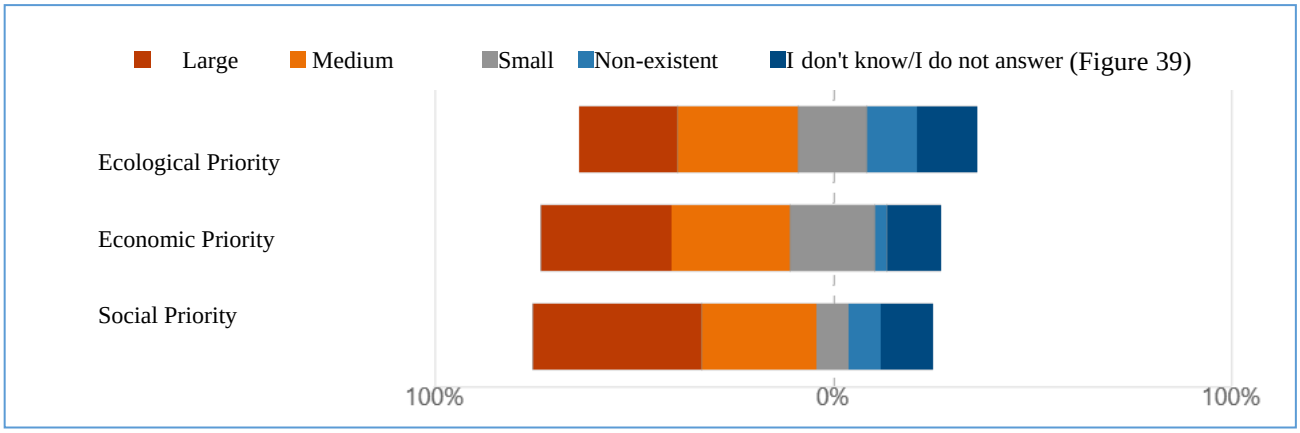
40) Marine biotechnologies extention is considered to be:



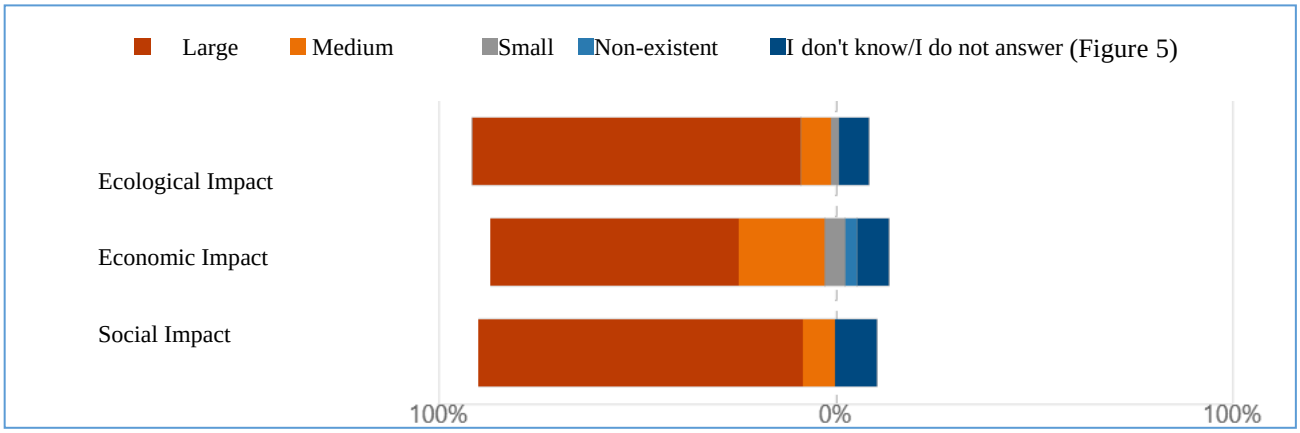
41) The extention of Nationally or Europeanly designated Marine Protected Areas (AMP) – Nature 2000 are considered to be:



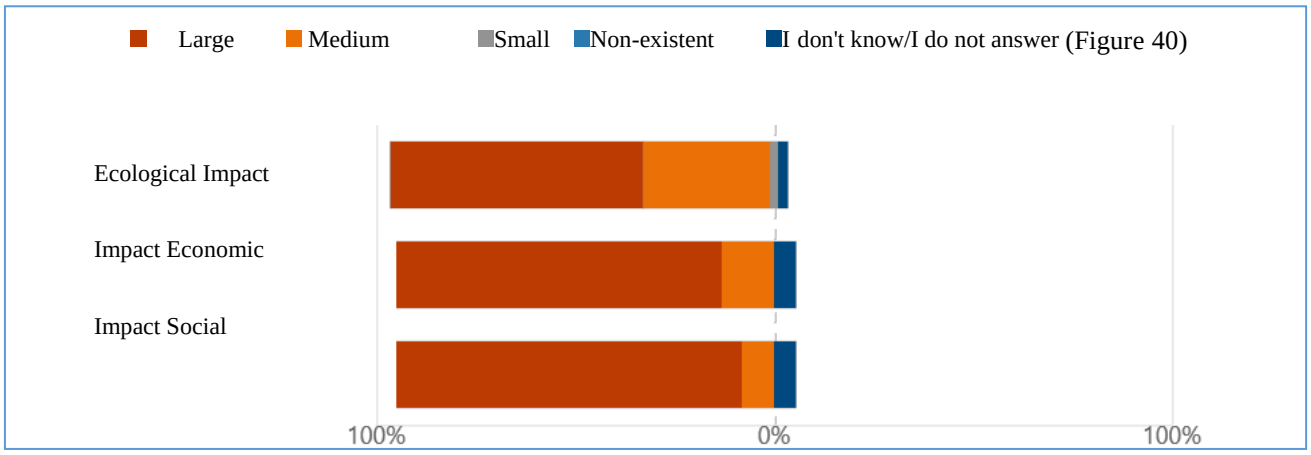
42) Marine defense and security (including training areas military**) is considered to be:**



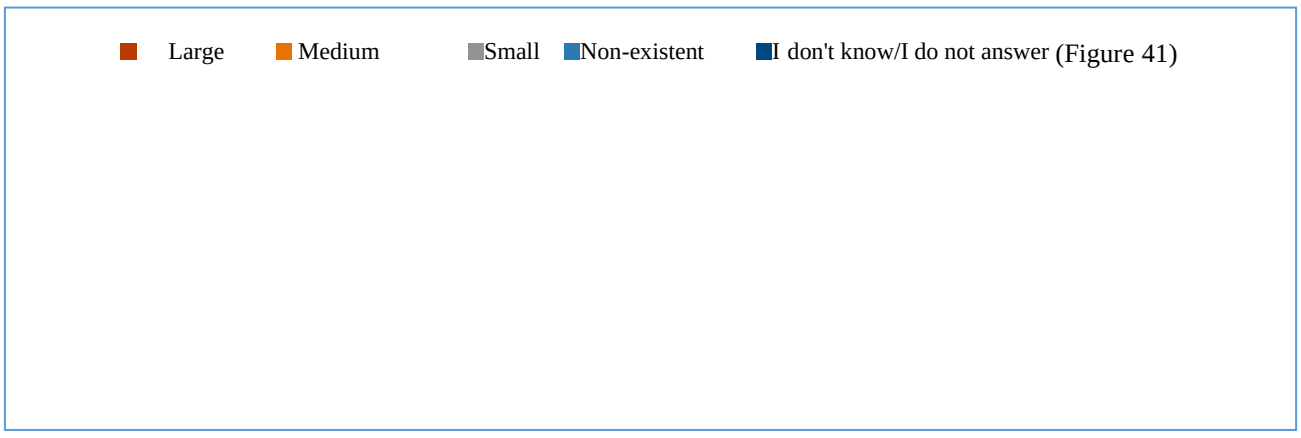
43) Extention of wastes (garbage and debris, etc**.) resulted from maritime activities, (**e.g. from shipping, marine transport**), is considered to have:**

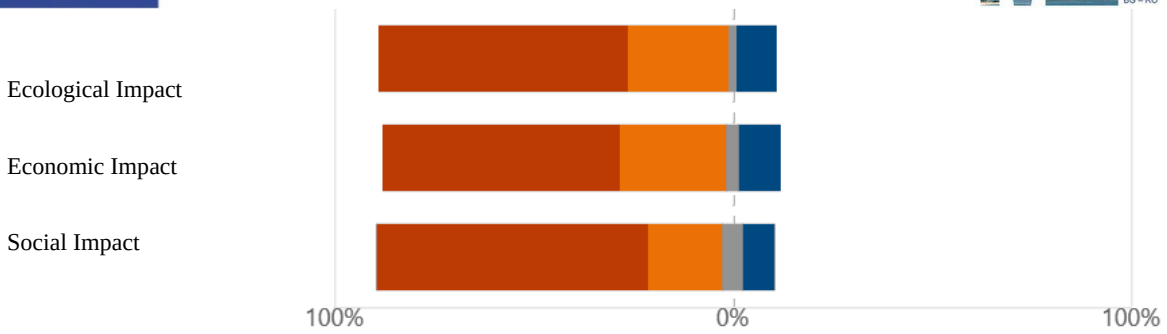


44) Extreme events (storms, floods, tsunamis) **are considered to have:**

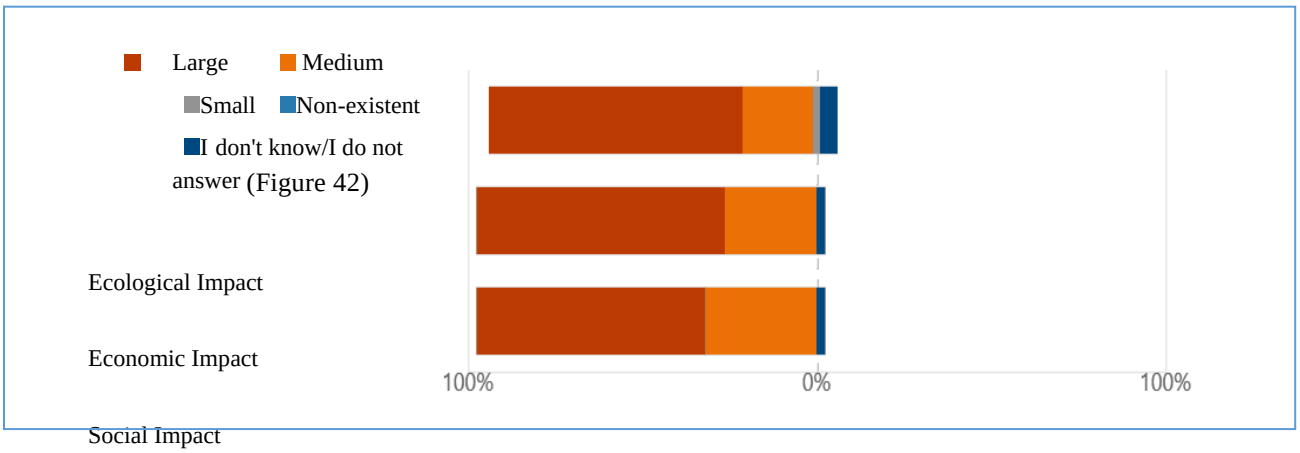


45) Sea level rise (global and local**) extention is considered to have:**

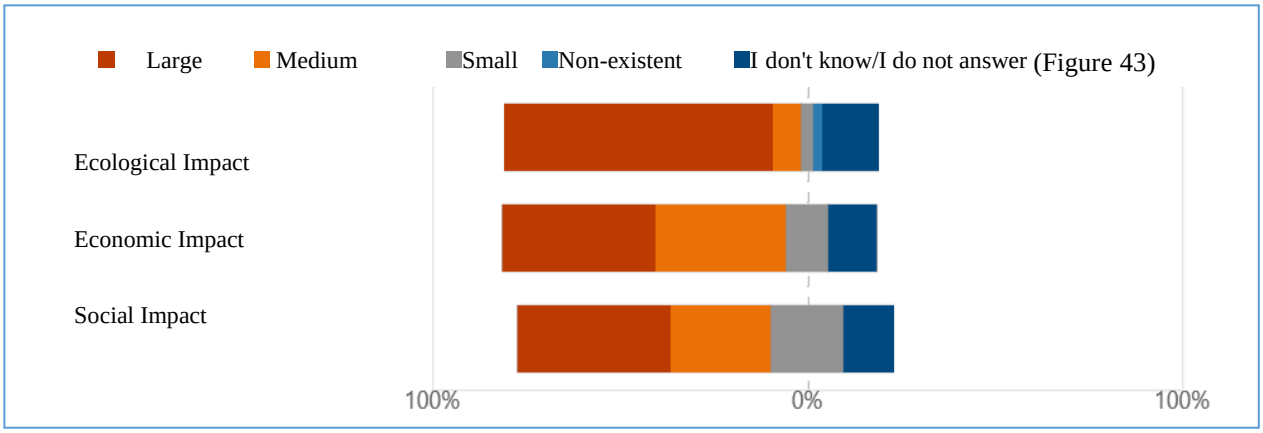




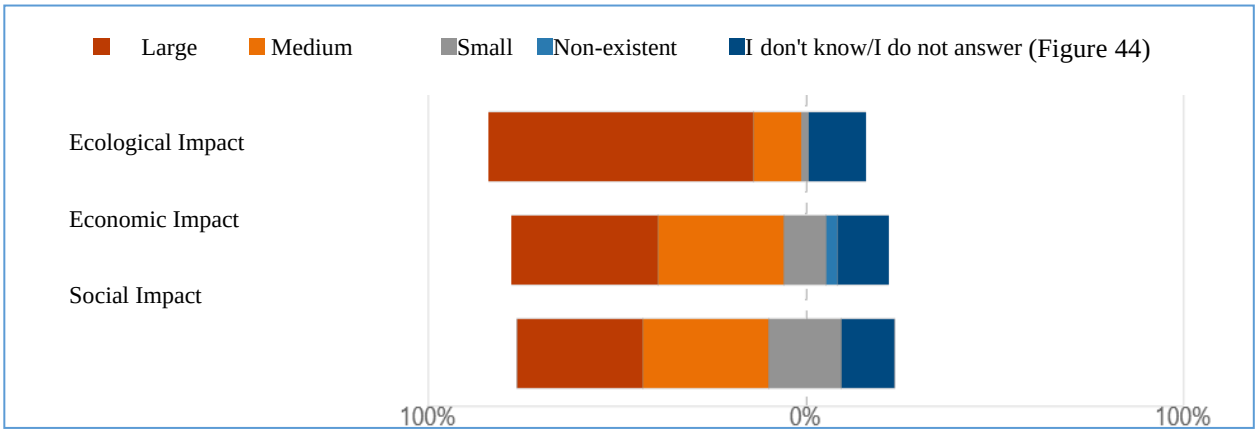
46) Risks to extent the coastal areas erosion, slips of land, floods/saline marine intrusions are considered to have:



47) Algal Blooming extent is considered to have:

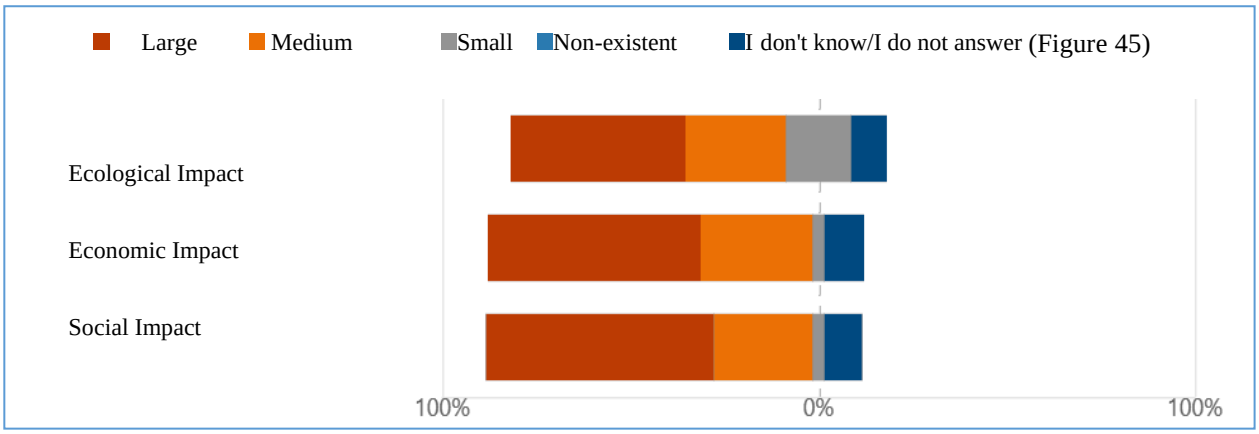


48) Eutrophication extent is considered to have:



(Figure 44)

49) Seismic events extent is considered to have:



(Figure 45)

3. Interpretation of questionnaire data processed

Stakeholders are at the driving part of MSP and their expertise and knowledge are crucial to identifying the current and future improvements of a LSI relationship integration with INCZM in the MSP.
The interpretation of the key stakeholders perception questionnaire comprise the perspective of the survey set up to develop the stakeholder feedbacks on LSI priorities and impacts, after the step of them +involvement identification for land and sea sectors at national/regional level.

Following the processing and interpretation of the questionnaire, several analyzes resulted, which were grouped into 3 large analyzes.

1. Considerations of the public and private entities perceptions on Land-Sea Interactions within the spatial domain Romanian coastal area in the context of Maritime Spatial Planning

After the identification of LSI relevant involved entities within the Romanian spatial domain in its both marine and coastal areas, the stakeholder perceptions study was developed in relation with the ***significant priorities*** for Land-Sea and ***main impacts*** for Sea-Land Interactions, towards a qualification done, in relation to the three measures/dimensions of sustainability: ***environmental, economic and social.***

The proposed stakeholder 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.

2. Results and discussion

The understanding of the aims and objectives of the MSP and the expected results of the integrated LSI addressing the compatible uses, is highlighted among several stakeholders, the general evaluation of the seaward pondered (land-based) interactions 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 activities.

2. Assessment of the participants perceptions incorporating seaward LSI influence as well as land-based activities' impact on marine environment in the context of Romanian Maritime Spatial Planning implementations

The evaluation of LAND-SEA INTERACTIONS 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 identificated.

- **Fishing** (question - 8) was considered as an intensively present activity in the marine coastal areas. It has a strong economic priority (64.1%), to be regulated properly, as well its ecological

impact (57.5%) on the water-mass of the coastal area is perceived as large, since fishing vessels operate at sea both inshore and offshore and often abandon gears with severe continuous damage on marine ecosystems (ghost fishing).

Table 1

Marin Fishing	Large	Medium	Small	I don't know/ I do not answer
Ecologic Priority	57.50%	30.00%	5.00%	7.50%
Economic Priority	64.10%	32.50%	0.00%	2.56%
Social Priority	56.76%	35.14%	5.41%	2.70%

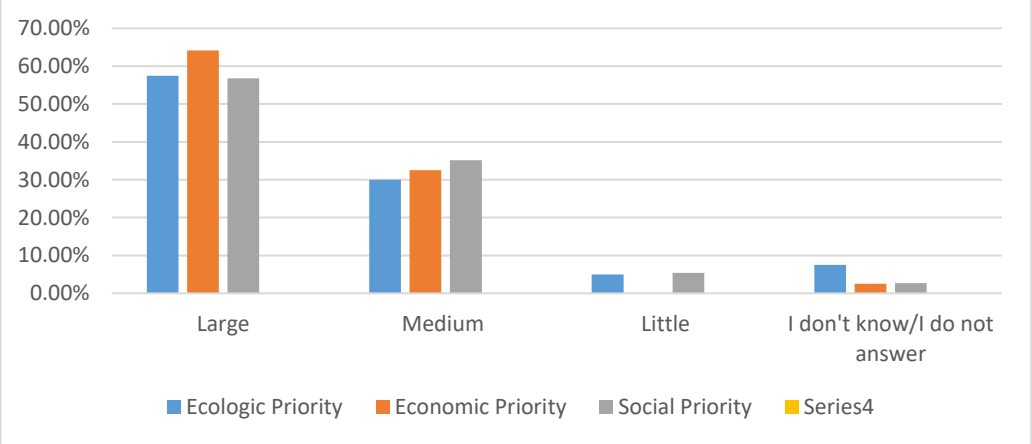


Figure 46. The scale of Marine Fishing Priority

- **Coastal and lagoon Aquaculture** (question 9), or intensive fish or shellfish farming involving organic material/solids and nutrients discharge in the marine environment or dangerous exotic species (like African catfish), and is recognized as potentially causing ecologic degradation rather an economic or social priority, probable due to its low representation at storm exposed Romanian littoral, with various challenges regarding economic sustainability.
- **Fishing in the coastal lakes** (question 10) has appreciated to more than 50% as an ecological priority rather than is social (pescatourism) or economic ones for the coastal community, being a source of litter that is discharged in the coastal environment.

- **Use of natural resources** (question 11) as ecosystem service was considering as having 70% ecological priority than its economic (63%) and social (55%) ones, because of their effects on the environment, and overexploitation trends.
- **Agriculture and Animal farming** (question 12) beyond environmental pressure statute, due to its economic significance are considered as Economic priority (75% of general opinion) and social priority (60%). The importance of the agriculture in Dobrobea region rural areas

along the coast due to chernozem soil type predominance needs low usage of fertilizers, with low potential of impact on coastal natural areas providing important habitats for the life cycle of species dependent on the marine environment due to lack of rivers (in a semi-arid region), but farming often is affecting ground waters and drinking water sources.

- **Industrial activity** (question 13) even is linked with low water quality and pollutants loads as ecological priority (of 58%), it was evaluate as economic (80%) and social (74%) priority within Romanian coastal area.
- **Renewable energy industry** (question 14) with a strong ecological priority (76%) and extension interdiction in the offshore areas, the activity has a strong economic priority (80%), tacking in consideration its remarkable development (more than land 5000 pieces of installed wind-propellers), requiring a designation of large inland areas, together with extension of electrical-grid for energy distribution, as infrastructures on the coast, far from shoreline.
- **Extraction of oil and gas** (question 15), despite its economic priority (69%), the activity was categorized at 50% ecological priority consideration, involving several support actions associated with high technological risks, related to refrainment of row materials, transportation of fuel, and interdiction of the gas extraction through fracture method in the Romanian coastal area.
- **Port activity and associated coastal protections** (question 16) as principal activity related to maritime transportation the activity was ranked to 82% Economic priority and 76% Ecologic priority due to its involvement at Constanta City socio-economic importance, supporting jobs and transportations and housing/urban development sectors. But the extensions of ports as marine obstacle was the main cause of coastal erosion, as a significant issue and risks with a strong socio-economic impact, as they can destruct coastal infrastructure, 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.
- **Transport** (question 17), considered as connected to maritime transport Danube-Black Sea channel/Danube River transport is including a very relevant demands in terms of space on land, inland port facilities and land connectivity infrastructures, thus connecting land and marine ecosystems through transport vectors from land to sea with an evaluated relative ecological importance (of 55%) but with large (more than 80%) of socio-economic priority.
- **Tourism and recreational activities** (question 18), with a continuous increase significance, the activity is reduced at three months by the seasonality of temperate climate. Touristic activity was considered as a large priority activity for regional and local coastal economy (77%), despite its low level of maritime-related activities and local employment, and its ecologic pressure (73%) on the natural ecosystem, in relation with deterioration of water

quality, marine litter massive/punctual sources, loss coastal habitats and high changes in salinity regime (tripling of sewage water input during summer season).

- **Biotechnologies** (question 19) was ranked with 55% ecological priority, considering its impact on coastal and marine ecosystems/biodiversity reduction by exploitation.
- **Marine Protected Areas** (question 20) as national parks, on-shore or with offshore boundaries, were considered 95% with large ecological priority, due to them purposes in coastal and marine conservation in relation with the marine environmental protection having regional sustainability goals.

- **Defense and Security areas** (question 21) were categorized positive in relation with social aspects priority (medium 33%), despite its large negative impact on marine ecology (29%).
- **Urban treatment plants** (question 22) as well **Discharge of residues/wastewater** (question 23), despite the extension and modernization of the associated infrastructure were ranked with large 90 and 95% Ecological priority, tacking in consideration its negative impacts on the environment, including marine chemical and biological pollution and pollution of the sea bottom along coastline.
- **Sewage outfalls** (question 24) was considered as principal coastal pressure with strong impact causing deterioration of water quality, including water quality of the bathing areas, due to the its input/loads from concentered land-based sources, and in consequence graded with 100% ecologic priority, despite of its 57.1% large and 42.8% medium socio-economic priority

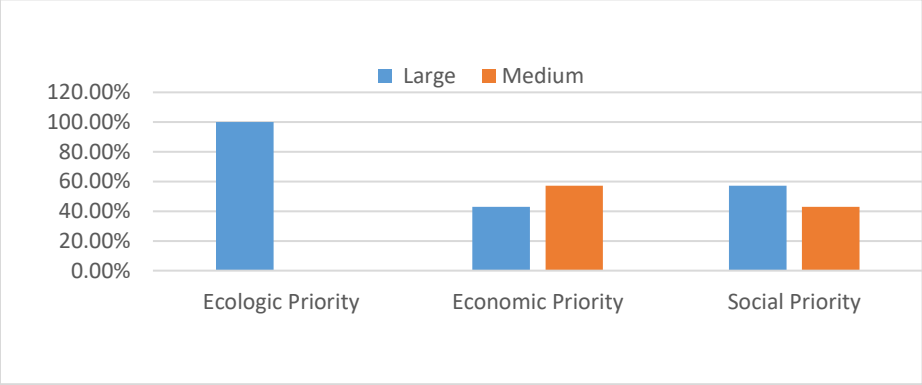


Figure 47. The scale sewage outfalls 'priority

3. Assessment of the stakeholder's perception regarding marine environment and sea-based activities influences on the Romanian Black Sea coastal area was asking bigger effort due to complex interactions encompassed.

- **Soil/coastal erosion** (question 25) is one of the most significant processes under direct influence of the climate change in relation with wind force, wave's hydrodynamics and sea level rise, but also with the anthropic unbalanced sediment supply is a main cause. Impacts of coastal erosion on coastal ecology was considered a large one (67.6%), due to the loss of coastal and marine habitats (biodiversity) and loss of landscape attractiveness, effects on touristic or transport infrastructure protection or for protection/re-constructions, with significant socio-economic efforts.

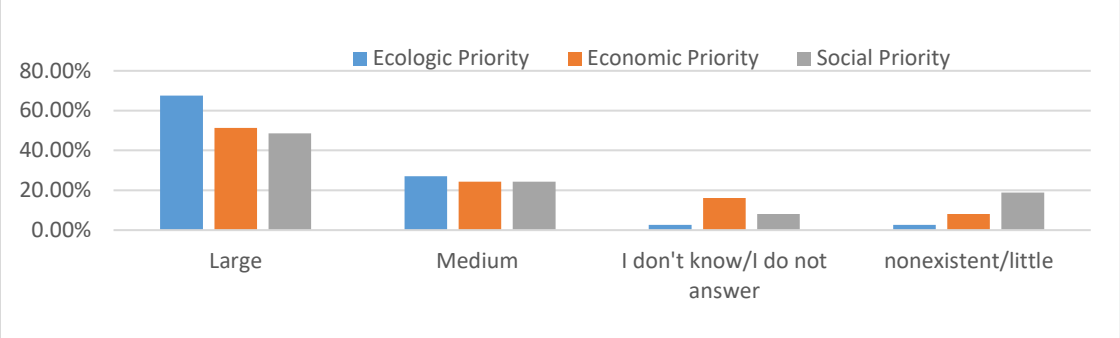


Figure 48. The scale soil erosion priority

Table 2

Which extention do you consider the Soil erosion	Large	Medium	I don't know/I do not answer	Nonexistent /small
Ecologic Priority	67.57%	27.03%	2.70%	2.70%
Economic Priority	51.35%	24.32%	16.22%	8.11%
Social Priority	48.65%	24.32%	8.11%	18.92%

- **Environmental degradation** (question 26) is produced by intensification of the marine originated factors, being linked with the marine and coastal (land - sea interface) habitats due to intense sediment deposition/erosion processes changing and transforming coastal wetlands, lagoons and Danube Delta saline regime or producing the intrusion of salty water in coastal aquifers of river bed, but also specificity of the natural landscape, and coastal biodiversity. Thus being rated with large ecological and social impact (circa 95%).
- **Hydrogeological instability** (question 27) of coastal cliffs erosion (landslide under wave or ground water influence) or underwater alluvial slope collapse (including Danube fan) can be accelerated by landward LSI, thus determining negative impacts on ecology but also in social aspects (having both an evaluation rank of circa 85%).
- **Transport of river sediments** (question 28) is a natural process, but no a continuous one, being strongly influenced, within a transitional (between land and sea) system of Danube Delta, by the fresh-salty water interface dynamics at the river mouth, linked with river hydrological regime and sea state, including sea-level rise.

- **Floods** (question 29) as exceptional or seasonal events, even is a characteristic of an impacted environment (now only medium ranked at 57%) by storms and precipitations regimes, which strongly influence the coastline dynamics through discontinuous sediment dynamics, and from these consequently impacting the coastal tourism and beach management/coastal protection activities with strong economic (57.1%) and social (71.4%) impacts at Romanian coast.

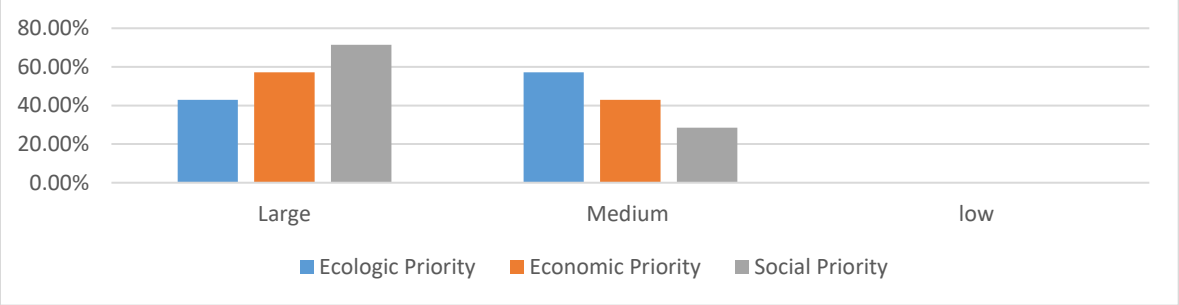


Figure 49. The scale floods 'priority

Table 3

To what extent do you consider that floods have	Large	Medium	Low
Ecologic Priority	42.86%	57.14%	0.00%
Economic Priority	57.14%	42.86%	0.00%
Social Priority	71.43%	28.57%	0.00%

- **Marine** originated **flooding** represents a secondary economic and social importance LSI because it is the coastal wetlands of Danube Delta Biosphere Reserve, as a seasonal natural process without strong impacts on human activities which locally and regionally are not well represented in the area.
- **Tectonic activities** (question 30) is a landward LSI due to the risk of earthquakes, tsunamis, remodeling of the coasts, and coastal shapes/relief, such as the sand barriers, river bars, stream beds in relation with the coastal habitats/environmental impact, but also with coastal infrastructure/heritage, having a terrific social impact (circa 80%) on human life and coastal economics (65%).

- **Seawater aquaculture/mariculture** (question 31) is a extensive/artisanal/in early stage industry at Romanian littoral, in the area of Eforie North touristic resorts without affecting hydrodynamics around the farm, but using the sheltered conditions of Constanta Port south jetty. The Aquaculture increases various challenges regarding economic priority due to its low impact, even this perceptions is largely considerate as an environmental issues (around 64%) without social importance (39%). 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, it will have several challenges due to its moderate social priority (40%).

- **Marine fish** (question 32) procurement within small industrial fishing efforts is determined by social preferences (medium, 45%), and it is impacted directly by marine weather/wave's regime and associated hydrodynamics at sub-mezoscale. The professional and recreational fishing at sea, river and lagoon afferent to the Danube delta coast, were qualified according to a large economic priority and impact (63%) and medium social one (50%), due to its degree of seasonality on a corridor of river-influenced fish migrations.

- **Extraction of oil and gas from the sea** (question 33) as an intense pressures in the present, generated by new stokes discoveries at higher depths of continental slope of the Romanian shelf, this interaction have s strong impact on economics (79%) bigger than environmental one (55%) due to its associated risks of the accidental oil spills, potential navigation accidents (risk of collision between ships and marine mammals) in an easy setup water waves/sea-state. The sector represents a risk also for the interaction of and coastal land-based activities, categorized in a medium range (45%)
- **Infrastructures of the Romanian seaside** (question 34) is related to the coastal infrastructures represented by the maritime ports of Constanta, Midia and Mangalia, in direct linkage with the development of the European maritime traffic corridors and maritime activities (fisheries). Positive large impact on the economy (71.4%) is compensated by an ecologic priority for green ecological infrastructure improvements (ranked at 85.7%).

Table 4

To what extent do you consider that Extreme Events (storms, floods, tsunamis) have	Large	Medium
Ecologic Priority	14.29%	85.71%
Economic Priority	71.43%	28.57%
Social Priority	100.00%	0.00%

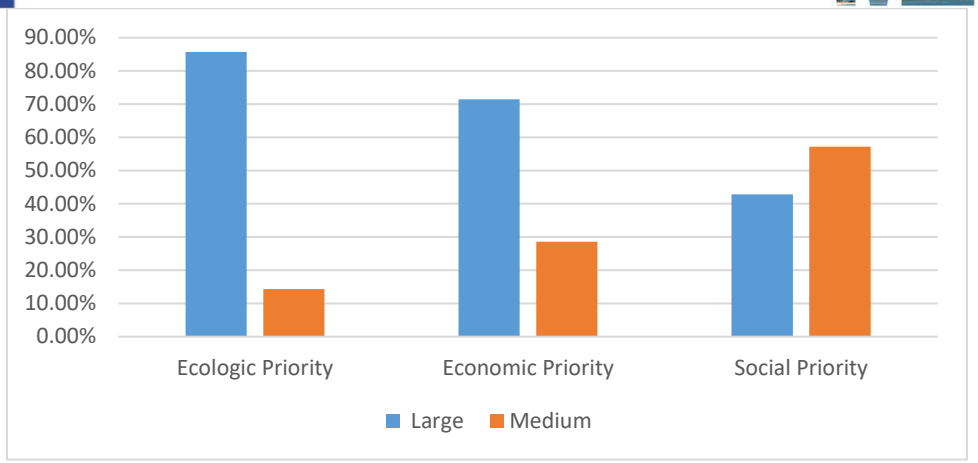


Figure 50. The scale extreme events 'priority

Table 5

To what extent do you consider that the infrastructures on the Romanian coast (ports, civil works of maritime / coastal engineering / artificial reefs, submerged dams, embankments, perpendicular to the coast, etc.)	**Large**	**Medium**
Ecologic Priority	85.71%	14.29%
Economic Priority	71.43%	28.57%
Social Priority	42.86%	57.14%

..

- **Submarine cables and pipes** (question 35) – requires an assessment of involved LSI as highly relevant human economic activity with a large priority (aprox.60%), under the influence of the marine and coastal hydrodynamics and anoxic regime extension at lower depths of the western Black Sea.
- **Dredging and storage of materials** (question 36) having an increased risk of dissipation or suspension caused by hydrodynamics intensely impacted by climate change, there are maritime activities ranked with large ecologic priority of mitigation of about 55%, despite its large/medium 45% economic priority/activity at "sea" interacting with "land".
- **Sea ports** (question 37) are affected directly by extreme wave regime under present climate change, its extreme storm return periods at 100% are expected to consistently affect some of those coastal/maritime transport hubs with significant implications on coastal infrastructure maintenance serving maritime activities with economic (90% classified) and social (61%) priority, particularly within ports jetties or defense breakwaters with ecological large effects of 50% in adjacent areas.
- **Maritime tourism** (question 38) activities, such as cruise tourism or leisure boating, represent, in particular, a medium social priority (58%), being in the same time an increased source of pressure (75% cumulus of large and medium ecological priority of mitigation) on the coastal natural ecosystem of the western Black Sea Basin, causing water quality issues (sewage),

marine litter/diffuse solid waste, shoreline and landscapes specificity damage, loss of biodiversity (species and habitats), changes in noise level/pollution as well.

- **Maritime recreational and sporting activities** (question 39) interactions among sea and land uses and activities, are linked with a specific infrastructure/installations or support activities expanded to the sea as well, thus under sea state variability categorized with large economic priority in the Romanian waters.

- **Marine biotechnologies** (question 40) has an economic with large (51%) significance, as services, information with large ecological pressure (72%), representing the human advanced research on the marine environment remedies with medium social priority of 50.5%, through sea-based activities of under the great challenges of new climate change.
- **European designated marine protected areas** (question 41) related to most of the vulnerable marine and coastal habitats related to large ecologic priority graded at 88%, is very influenced by sea-based human activities as fishing, navigation and littering, drilling/oil extraction and afferent activities, having large negative social impacts (55%).

- **Marine defense and security** (question 42) was perceived as having low ecologic significance, rather than social one (large 42%), based on employment in military maritime sector, in relation with intensity of landward influences of sea state/regime, impacting the sea water characteristics, as well as coastal sediment texture.
- **Wastes** (question 43) coming from diffuse source landward, due to shipping, cruise tourism and extraction industry aggravating water and noise pollution, as well as increasing solid plastic wastes and various marine litter, thus having a outsized (ranked 80%) 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 in consequence.

- **Extreme events (storms, floods, tsunamis)** (question 44) from deep sea can involve huge energy of the interactions from sea to land, in the case of what , the involvement of a large economic (71.4%) and social (100%) priority for a rapid action for defending is crucial, and its associated medium ecologic priority of adaptation (85.7%) to extreme weather conditions inducing marine flooding events is responsible of infrastructure improvements for mitigation of effects on coastal tourism and marine protected areas/MPAs.

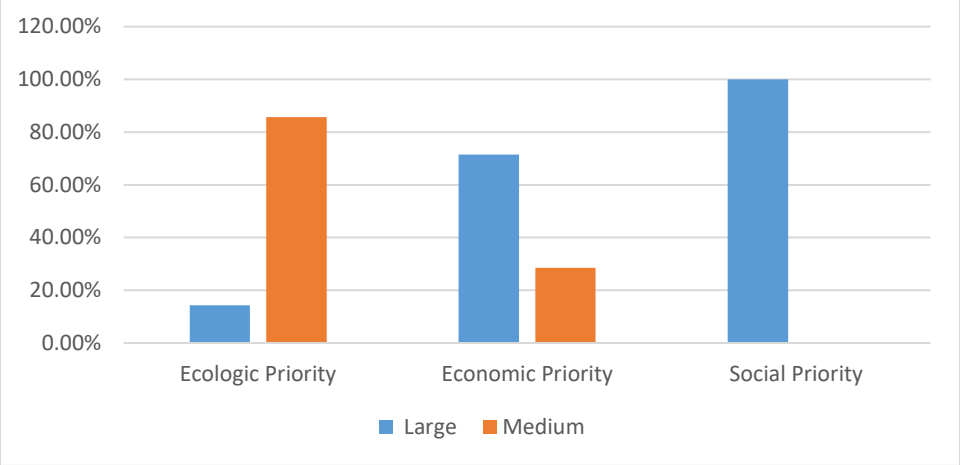


Figure 51. The scale extreme events 'priority

Table 6

To what extent do you consider that Extreme Events (storms, floods, tsunamis) have	Large	Medium
Ecologic Priority	14.29%	85.71%
Economic Priority	71.43%	28.57%
Social Priority	100.00%	0.00%

- **Sea level rise (global and local)** (question 45) as a climate changes indicator, it is associated with coastal erosion, intense storm surges induced linked with the occurrence of extreme events, by future climate changes thus exacerbating the existing hazards. The proposed large ecologic and social priority of action, placed at 71.4%. The economic priority of this key LSI interactions can be considered in vulnerability and hazard assessments at medium 71.4% priority as well, because loss of coastal infrastructures related to tourism/housing facilities is leading to significant economic loss).

Table 7

To what extent do you consider that sea level rise (global and local) to have	Large	Medium
Ecologic Priority	71.43%	28.57%
Economic Priority	28.57%	71.43%
Social Priority	71.43%	28.57%

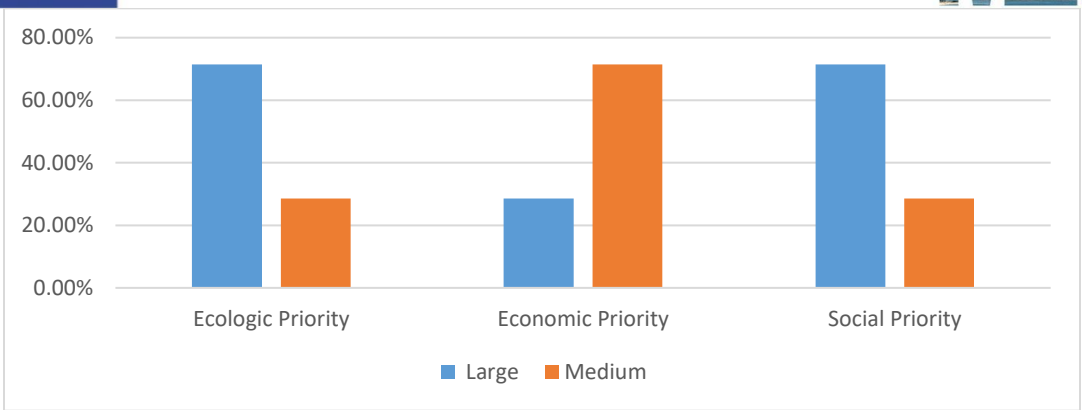


Figure 52. The scale extreme events 'priority

- **Risks to coastal areas (coastal erosion, floods/ saline marine intrusions)** (question 46) has a large ecologic, economic and social significance (70-85%), based on the intensity of landward influences, thus bringing severe movements of goods, services, information and people through coastal areas, with a vulnerable infrastructures, environment, cultural heritage and economic activity.

- **Algal bloom** (question 47) and its extreme case of the **Eutrophication** (question 48) are both under the influence of underwater light regime as well under nutrients loads enforced by the up-welling phenomena, as a consequence of changing in wind predominance relative to the Romanian shoreline/coast orientation. Due to its ecological impact (85.7%) on coastal biodiversity related to extreme anoxic regime, these LSI are well monitored by CMEMS.

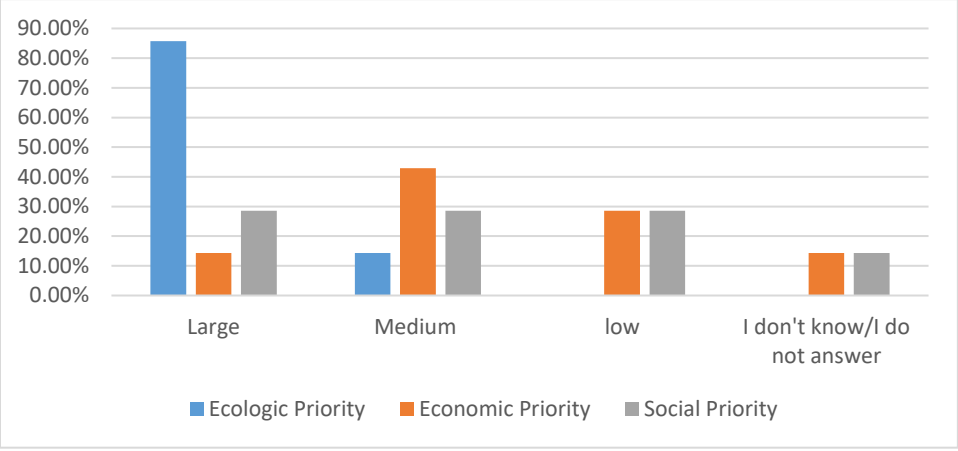


Figure 53. The scale eutrophication 'priority

Table 8

To what extent do you think Algae blooming has	Large	Medium	low	I don't know/I do not answer
Ecologic Priority	85.71%	14.29%	0.00%	0.00%
Economic Priority	14.29%	42.86%	28.57%	14.29%
Social Priority	28.57%	28.57%	28.57%	14.29%

- **Seismic events** (question 49) are well monitored on Romanian shelf by Enso-Euxinus network focused on seismic risks. This interaction can spread both from land to sea and from sea to land depending of its epicenter. Seismic events have strong impacts on social (64%) and economy (60%) despite its effects the coastal/inland environment in case of tsunami. But the tsunamis are rare if not impossible events due to a extremely wide shelf and the placement of the continental margin at around 200km seaward, which can dissipate the impact of a long-wave through breaking far from the shoreline.

5) Conclusions

Despite their limitations of a questionnaire based survey, designed for stakeholder community acting in coastal and maritime Romanian zone, the subsequent analyses were developed in relation with the key priorities for Land-Sea and Sea-Land Interactions' main impacts, towards a qualification relative prepared to the three significant dimensions of sustainability: environmental, economic and social. Therefore, the results of the questionnaire survey were appropriately interpreted within a successive evaluation based on selection of several degree of impact on the environment or on the socio-economic activities. In the selection of the LSI keys components encompassing land or maritime economic activities and natural processes involved in the two-way interactions, it was considered from the stakeholders' expert opinion perspective, having certain mitigation implicit actions for significant identified impacts.

The general evaluation of the seaward pondered (land-based) interactions shows that the environment is mainly reflected as a principal priority, and also the ecological impact were considered as main landward (sea-based) influences of the marine natural environment, and offshore related activities, as well.

Furthermore, several responding entities were given emphasis to that existent interactions between the maritime space and its afferent coastal zone, considering as inconsistent the changes of the natural processes, marine resources uses and socio-economic activities, in both ways conducts' interaction, the land-sea and sea-land interactions.

Afterwards, both LSI interaction were pass through a number of criteria to be identified in order to delimitate the area of LSI analysis in the specified zone of interest of Romania, in correspondence with a semi-qualitative scale, considering "functional scope" of LSI, dependent on physical characteristics, human activities and natural and anthropogenic processes, as well as on the maritime governance aspects. For the crossborder areas the main features of the Romanian side were underlined (Tab.9)

Conclusions concerning ecological problems, environment protection, biodiversity conservation, in Mangalia area, Table 9

Main features encountered 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	-	-	-

Conclusions concerning specifical social-economic features and spatial planning in Mangalia area, Table 10

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			

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