



UNITED
NATIONS

EP

UNEP/MED WG.490/3



UNITED NATIONS
ENVIRONMENT PROGRAMME
MEDITERRANEAN ACTION PLAN

1 March 2021
Original: English

Meeting of the Ecosystem Approach Correspondence Group on Marine Litter Monitoring (CORMON Marine Litter)

Videoconference, 30 March 2021

Agenda Item 3: Interrelation of Pressures Impacts of Marine Litter and the Status of Marine Ecosystem Components

Addressing Interrelation of Pressures-Impacts of Marine Litter and the Status of Marine Ecosystem Components

For environmental and cost-saving reasons, this document is printed in a limited number. Delegates are kindly requested to bring their copies to meetings and not to request additional copies.

Note by the Secretariat

At their 19th Ordinary Meeting (COP 19, Athens, Greece, 9-12 February 2016), the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) adopted a novel and ambitious Integrated Monitoring and Assessment Programme and related Assessment Criteria (IMAP).

The Regional Meeting on IMAP Implementation: Best Practices, Gaps and Common Challenges (IMAP Best Practices Meeting, Rome, Italy, 10-12 July 2018) welcomed the work undertaken by the Secretariat and MAP Components to support the implementation of IMAP at regional, sub-regional and national levels, including several cross-cutting issues, as provided in UNEP/MED WG.450/3. The Meeting further requested the Secretariat to present the following issues for further review and in-depth discussions in the upcoming CORMONs:

- The interlinkages between activities/pressure/impacts and clarification of definition of impacts noting that such a definition should primarily focus on biodiversity aspects;
- Updating Tables 1, 2 and 3 of document UNEP/MED WG.450/3, based on feedback and inputs received during the Meeting, for further review by the CORMONs; and
- Clarifying definitions of integration and aggregation rules opting for giving priority at this stage to the work for IMAP implementation on geographical aggregation and assessment scaling rather than integration.

During the 21st Ordinary Meeting (COP21, Naples, Italy, 2-5 December 2019), the Contracting Parties endorsed in Decision IG.24/4 the 2023 Mediterranean Quality Status Report (MED QSR) roadmap and needs assessment as contained in Annex V of this Decision and request the Secretariat to further define in 2020-2021, together with the Contracting Parties and CORMONs' concrete requirements and deadlines of output delivery at the level of common indicators per each Contracting Party in order to ensure effective data collection and to address knowledge gaps to enable the entire MAP system to successfully deliver the 2023 MED QSR.

In this context, UNEP/MAP and its MED POL programme furthermore elaborated in the present document the interrelation of pressures-impacts of marine litter and the status of marine ecosystem components which is submitted to the Ecosystem Approach Correspondence Group on Marine Litter Monitoring (CORMON Marine Litter) for their review and kind consideration.

Table of Contents

1. Introduction.....	1
2. Interaction of pressures, impacts and state of the marine and coastal environment in the Mediterranean.....	1
3. GRID/Table Approach.....	2
3.1. Pressure analysis for IMAP Common Indicator 22 (CI22).....	3
3.2. Pressure analysis for IMAP Common Indicator 23 (CI23).....	3
4. An Example of Quantitative Approach for Beach Marine Litter (IMAP CI 22).....	8
5. Conclusions.....	9

Annex I: Matrixes of Interactions Between Elements of the ICZM Protocol and Principal Activities Affecting Marine Litter Generation at Regional/Sub-Regional Levels

List of Abbreviations / Acronyms

AD	Adriatic
BV	Baseline Value
CI	Common Indicators
CM	Central Mediterranean
DPSIR	Drivers, Pressures, State, Impact and Response
EM	Eastern Mediterranean
EO	Ecological Objectives
GES	Good Environmental Status
ICZM	Integrated Coastal Zone Management
IMAP	Integrated Monitoring and Assessment Programme
MAP	Mediterranean Action Plan
MED POL	Mediterranean Pollution Assessment and Control Programme
NEAT	Nested Environmental Status Assessment Tool
TV	Threshold Value
UN	United Nations
WM	Western Mediterranean

1. Introduction

1. The evaluation of all IMAP EOs and its consideration as functional units of the marine ecosystem in its entity should allow the definition and assessment of achievement of Good Environmental Status (GES).

2. To progress towards integrated GES assessment further work is required on a number of issues including (i) the harmonization of monitoring and assessment methods; (ii) the definition of links between assessment scales, pressures and cumulative impacts on ecosystem components; (iii) the improvement of long time series of quality assured data to monitor the trends; and (iv) the improvement of data management and data accessibility through the MAP Info-System for all the IMAP Common Indicators (CIs).

3. The present paper elaborated these elements for IMAP E10 – Marine Litter and its respective Common Indicators 22 and 23 based on the expert input received from several Contracting Parties.

2. Interaction of pressures, impacts and state of the marine and coastal environment in the Mediterranean

4. There are several approaches to support the integrated assessment where the predominant human-related pressures and their impacts on the marine and coastal environment are examined aiming to assess the state of the marine environment (i.e. DPSIR-based assessments); which subsequently produce and build policy responses (e.g. measures and priority actions) to address the main drivers (e.g. economic sectors and activities) causing the degradation of the marine ecosystem and its ecosystem services.

5. The following subsections explain some of the most commonly used GES-integrated assessments based on DPSIR approach that have been acknowledged and approved¹ in principle:

- **GRID/Table Approach:** aiming to cross-map all the anthropogenic activities with significant contribution to pressures linked with the respective IMAP Common Indicators used for monitoring and assessment. Expert judgment can/may better define/refine specific interactions, for those activities contributing to pressures at Common Indicator level considering sub-regions, or, if relevant and appropriate, sub-divisions or lower geographical units (using as appropriate the nested approach).
- **Scoreboards Method:** aiming to quantify the interrelation between pressures and impacts following a risk-based approach which is particularly effective for Ecological Objectives that are spatially patchy and where the relevant pressures are local-specific. This method is similar to the GRID/Table approach; however, it uses numeric scores (i.e. assignment of a numeric value by categories) rather than stand-alone colours, which allow the estimation/calculation of quantitative information.
- **Neat Approach:** The Nested Environmental Status Assessment Tool (NEAT)² is a pioneering tool developed specifically to assess the marine environment. It uses a combination of high-level integration of habitats and spatial units; therefore, allowing for specification on structural and spatial levels, applicable to any geographical scale.

¹ Reviewed and approved by the 2019 Meetings of the CorMon on Pollution Monitoring (Podgorica, Montenegro), the MED POL Focal Points (Istanbul, Turkey), and the 7th Meeting of the Ecosystem Approach Coordination Group (Athens, Greece).

² Borja A., M. Elliott, J. Andersen, T. Berg, J. Carstensen, S. Halpern (2016). Overview of integrative assessment of marine systems: the ecosystem approach in practice. *Front.Mar.Sci.* 3:20. doi:10.3389/fmars.2016.00020

6. For the case of marine litter (IMAP EO10) there is a need to ensure a better integration and interaction of pressures, impacts, and state elements in assessing and towards achieving the Good Environmental Status (GES). This is particularly important when we are entering into the specific IMAP EO10 Common Indicators (i.e. CI22 and CI23).

7. In order to carry out the interrelation of pressures and impacts for marine litter with the ecosystem's components state, using the correlation matrices agreed upon by the Contracting Parties (Tables 1 and 2), this document reflects the input received by 5 Contracting Parties to the Barcelona Convention (Bosnia and Herzegovina, Greece, Israel, Italy, Spain).

8. Two different approaches have been used to integrate the predominant pressures of marine litter and their impacts on the marine and coastal environment; the GRID/Table approach; and the Scoreboard approach which are described hereunder.

3. GRID/Table Approach

9. Pressures for marine litter can be considered in the two following ways: (i) at source, i.e. focusing on the primary and main activities generating the pressure; this aspect is relevant for setting environmental targets and defining measures aiming at reducing the pressures in order to achieve or maintain GES; and (ii) at sea, i.e. the level of pressure in the marine environment to which the different elements of the ecosystem are subjected; this aspect is particularly relevant for determining GES for both IMAP pressure-based and status-based Common Indicators.

10. In this regard, the inputs related to GRID tabular matrix interrelating pressures/impacts and state of marine ecosystem components received from the 5 Contracting Parties were compiled and integrated into a single-one according to the sub-region to which they belong, and the respective Common Indicator has been evaluated in relation to the pressure having the greatest impact (Tables 1 and 2) for each criterion (CI22 and CI23) in each sub-region.

11. Intensity of natural and anthropogenic pressures have been evaluated according to the following color code, grouped by sub-regions, and ordered by the worst result obtained:

3	Significant Contribution of the Activity to Pressure
2	Minor Contribution of the Activity to Pressure
1	No Activity but Possible Development of the Activity
0	No Contribution to Pressure

12. Tables 1 and 2 provides a tabular representation of interactions between pressures and impacts and IMAP EO10 respectively its Common Indicators 22 and 23. The introduced table cross-maps all the anthropogenic activities with significant contribution to pressures with the Common Indicators used for IMAP EO10 marine litter monitoring and assessment. Expert judgment, including inputs received from 6 Contracting Parties, contributed to better refine the specific interactions, for these activities contributing to pressures at Common Indicator level considering sub-regions, or, if relevant and appropriate, sub-divisions or lower geographical units (using as appropriate the nested approach). Certainly, additional expert input is required for a more accurate regional representation however Tables 1 and 2 already include a very useful analysis which could facilitate setting the scene for the way forward.

3.1 Pressure analysis for IMAP Common Indicator 22 (CI22):

13. Based on the input received, the assessed greatest pressure in all sub-areas is generated by the sector of tourism, followed by other sectors i.e. coastal urbanization, solid waste management, and agricultural and forestry practices (Table 1).

14. Renewable energy facilities are those that produce the less important pressure, followed by the extraction of genetic resources, research and activities, defense activities, and cables and pipes installation.

15. There are some differences between sub-regions: in the Western Mediterranean, tourism stands out as the greatest pressure in all its sub-areas. However, in the Adriatic, coastal construction, aquaculture, and solid waste management are also highlighted as important pressures.

16. As far as the Central and Eastern Mediterranean are concerned, the most important pressures coincide; i.e. agricultural and forestry activities, cruises, coastal urbanization, fishing (including recreational fishing), and solid waste management.

17. In general, the variations between the sub-regions are small, although resulting to be the same greatest pressures in all of them.

3.2 Pressure analysis for IMAP Common Indicator 23 (CI23):

18. The greatest pressure in all sub-areas is generated by the fishing sector, followed by aquaculture (Table 2).

19. Renewable energy facilities, energy extraction, research and education activities, and the extraction of genetic resources are the ones that produce the least pressure.

20. However, there are some differences between sub-regions. In Western Mediterranean, tourism, wastewater discharge, and fishing stand out as those that produce the most pressure; while in the Adriatic, fishing and aquaculture stand out as important pressures.

Table 1: Interrelation of natural and anthropogenic pressures (selected based on the main activities in terms of pressures as provided by ICZM Protocol and other Barcelona Convention`s Protocols) affecting the marine ecosystems and the measurement IMAP Common Indicator 22.

Pressures vs. measures IMAP EO10 Common Indicator 22	Sub-Regions	Common Indicator 22 (Ecological Objective 10)				
		Mediterranean Average	Aegean and Levantine Sea	Central Med. Sea	Adriatic Sea	Western Med. Sea
Non-Construction Zone						
Natural Hazards						
Natural disasters						
Climate Change						
Agric. and forestry runoffs						
Coastal Urbanization						
Damming (demand on water)						
Waste-water discharges						
Industry						
Tourism frequentation						
Yachting						
Marine mining						
Dredging						
Desalimization						
Coastal artificialization.						
Port operations						
Offshore structures						
Cables and pipelines						
Shipping						
Oil and gas extraction						
Renewable energy						
Fishing (incl. recreational)						
Sea-based food harvesting						
Extraction of genetic resources						
Aquaculture						
Solid waste disposal						
Storage of gases						
Research and education						
Defense operations						
Damping of munitions						

Table 2: Interrelation of natural and anthropogenic pressures (selected based on the main activities in terms of pressures as provided by ICZM Protocol and other Barcelona Convention`s Protocols) affecting the marine ecosystems and the measurement IMAP Common Indicator 23.

Pressures vs. measures IMAP EO10 Common Indicator 23	Common Indicator 23 (Ecological Objective 10)				
	Mediterranean	Aegean and Levantine Sea	Central Med. Sea	Adriatic Sea	Western Med. Sea
Sub-Regions					
Non-Construction Zone					
Natural Hazards					
Natural disasters					
Climate Change					
Agric. and forestry runoff					
Coastal Urbanization					
Damming (demand on water)					
Waste-water discharges					
Industry					
Tourism frequentation					
Yachting					
Marine mining					
Dredging					
Desalination					
Coastal artificialization.					
Port operations					
Offshore structures					
Cables and pipelines					
Shipping					
Oil and gas extraction					
Renewable energy					
Fishing (incl. recreational)					
Sea-based food harvesting					
Extraction of genetic resources					
Aquaculture					
Solid waste disposal					
Storage of gases					
Research and education					
Defense operations					
Damping of munitions					

21. As far as the Central and Eastern Mediterranean are concerned, the most important pressures coincide; i.e. agricultural and forestry activities, cruises, coastal urbanization, fishing (including recreational fishing), and solid waste management. This is also the case for IMAP CI22 where the same types of pressured are highlighted as important.

22. In general, the fundamental and main pressures for IMAP EO10 CI22 and CI23 are not the same. While tourism and coastal construction are the most important for IMAP EO10 CI22; fisheries and aquaculture are those that fundamentally affect IMAP EO10 CI23.

23. Results for both indicators integrating the most significant contribution of the corresponding sectors/ activity(ies) to pressure for the four Mediterranean Subregions (red colour; Tables 1 and 2) give us information on those that mostly contribute to generation of marine litter impacts in the Mediterranean Basin (Table 3).

Table 3: The most significant contribution of corresponding sectors/ activity(ies) to pressures on marine ecosystem from marine litter in the four Mediterranean Subregions

	CI22	CI23
Agricultural and forestry runoffs	✓	✓
Coastal Urbanization	✓	✓
Waste-Water discharges	✓	✓
Tourism frequentation	✓	✓
Yachting	✓	✓
Fishing	✓	✓
Aquiculture	✓	✓
Solid waste disposal	✓	✓
Damping of munitions	✓	✓

24. Further to the interrelation of IMAP EO10-Marine Litter and its respective Common Indicators 22 and 23 with the relevant natural and anthropogenic pressures, by applying GRID approach, as provide above in Tables 1 and 2, a Scoreboard method was applied in order to initially quantify the magnitude of impacts of the pressures with the most significant contribution over the ecosystem components.

25. The approach applied is provided in Annex I that is based on Excel tool used for an expert-based evaluation both of category of pressures and impact scores. It allows estimating (in %) how many categories of pressures have the potential to threat the marine ecosystem regarding marine litter. Experts involved in such evaluation provide an assessment for each pressure type through a 0/1 score: 1 indicating the presence of the potential risk and 0 its absence. The final score is than expressed in percentage, dividing the sum of all scores for the number of scored pressured (activity types).

26. The same Excel tool enables to estimate the magnitude of impacts (in %) by adapting its conceptual objective. Thus, for each category of pressures the experts involved in the evaluation are invited to express a 0 to 3 score: 0 indicating the absence of the impact, while 1, 2 and 3 respectively indicating the presence of an impact with low, moderate and high magnitude. Similarly, to the analysis on the occurrence of potential threats, the final score is expressed in percentage and is obtained by dividing the sum of all scores by the maximum theoretical score (equal to the number of scored items i.e. category of pressures multiplied by 3).

27. Regarding the impacts of marine litter on the marine and coastal environment, as a first approximation, the results obtained for IMAP EO10- Marine Litter Common Indicators 22 and 23 (Annex, Table II, III, IV and V) are presented in a summarized way under Table 4 hereunder.

28. The quantitative estimation of the overall impacts of pressures related to IMAP CI22 (Table 1) was provided for inland and coastal areas; while quantification of impacts of pressures of relevance for IMAP CI23 (Table 2) was provide in offshore areas (Annex, Table I).

29. The value of the % of total impact on the Mediterranean is considered as the current average situation (Table 4), the higher values for each subregion can be considered high (red; Figures 1 and 2) and the lower values as moderate (orange; Figures 1 and 2)

Table 4: Scoreboard approach results

	Overall of Pressure-Impact (%)	Inland % of total impact	Coastal Area % of total impact	Offshore % of total impact
WM	16	6	17	23
AD	32	24	30	41
CM	23	18	23	28
EM	23	13	25	28
Mediterranean Sea	22	12	24	27

30. Accordingly, it can be concluded that 22% of category of pressures recorded in Mediterranean against the list of main activities in terms of pressures as provided by ICZM Protocol and other Barcelona Convention's Protocols, contribute to generation of marine litter impacts on ecosystem components. The 24% and 27 % of all category of pressures related to marine litter generate impacts over ecosystems in coastal and offshore areas respectively (Table 4).-According to this it can be concluded that 24% respectively 27 % of all category of pressures related to marine litter generate impacts over ecosystems of coastal respectively offshore areas. Moreover, 12% of all category of pressures related to marine litter generate impacts over ecosystems from inland areas.

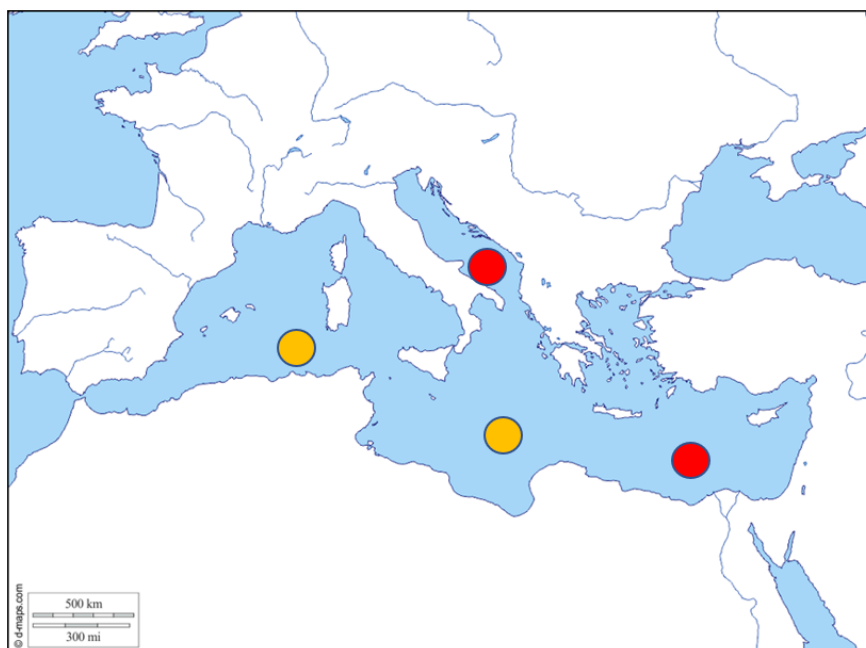


Figure 1: Results of overall pressures/impacts in coastal areas of the Mediterranean (Red:>24%; Orange <24%)

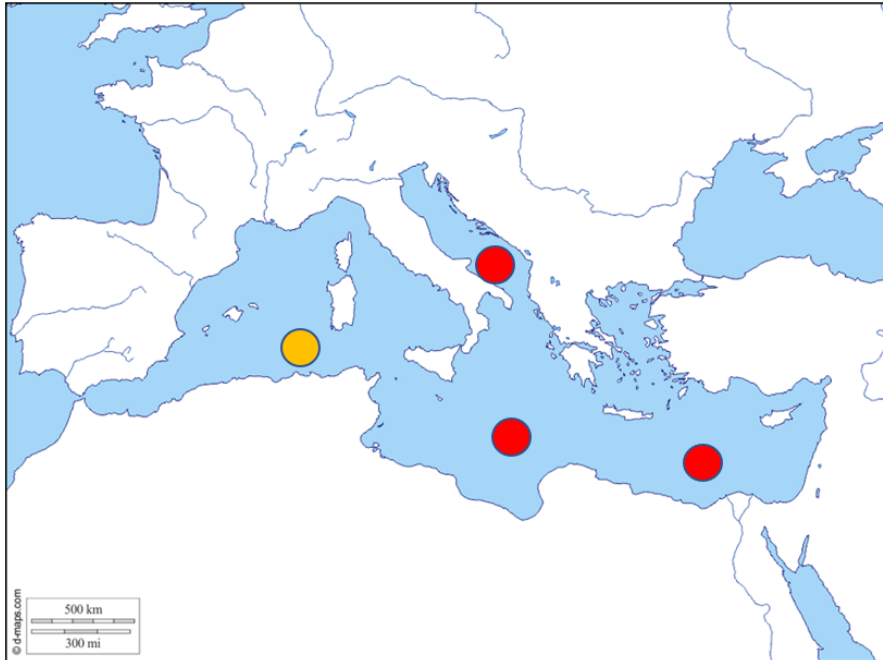


Figure 2: Results of overall pressures/impacts in offshore areas of the Mediterranean (Red: >27%; Orange: <27%)

4. An Example of Quantitative Approach for Beach Marine Litter (IMAP CI 22)

31. As a possible approach for the quantitative assessment of the GES considering the impacts of pressures related to IMAP EO10 Common Indicator CI22 (beach macro-litter), the following steps could be applied.

32. Based on the statistical analysis of the data provided by several Mediterranean countries (UNEP/MAP WG.482/24) the quantitative approach for IMAP Common Indicator 22 (CI22 – Beach Marine Litter) is provided hereunder.

- Mediterranean BV: 329 item/100m
- Mediterranean TV:
 - Q10= 59 item/100m
 - Q20= 106 item/100m

33. In this respect, specific BV for the respective sub-region could be established; and thus comparing the Mediterranean TV (Q10-Q20) and BV by establishing three different colour ranges; for example:

- Sub-regional BV < TV: **Green**
- TV < Sub-regional BV < Mediterranean BV: **Orange**
- Sub-regional BV > Mediterranean BV: **Red**

34. According to the results obtained though initial testing of the approach described, it will be possible to assess whether there is any link between the subregions (i.e. WM, CM, AD, EM) and any of the resulted 1st, 5th, 10th or other percentile (i.e. Q01, Q05 and Q10 etc.). This approach needs to be further tested in order to confirm its reliability.

35. In order to reach the GES, efforts should be focused for example on the activities identified as the most important marine litter generators (Table 3). This would allow the decrease of the total amount of beach marine litter found in the surveys. If the implementation of these measures is correctly developed, then the different subregions (i.e. WM, CM, AD, EM) would probably reach a medium colour status range, linked with decreasing effects and impacts on marine and coastal environment.

5. Conclusions

36. In order to reach the GES, efforts should be focused in decreasing the impact of the 3 specific activities as identified the most important on marine litter generation (Table 3). This would allow the decrease of the total amount of marine litter recorded in the surveys. If the implementation of key/selected reduction and prevention measures in the Mediterranean is applied in a coherent way across the region, there is an indication for WM, AD and CM reaching GES, while EM will reach a medium colour status range, decreasing the effects and impacts on marine and coastal environment (Table 4).

37. A number of measures can be proposed (listed hereunder) to be applied at national level, focusing on the activities that are contributing with a high level of interaction in the respective sub-regions (Tables 1 and 2): i.e. urbanization, tourism, fishing and agriculture. The other activities with high impact in the Mediterranean (Table 3) have an irregular relevance depending the subregion (Annex, Tables II, III, IV and V).

- Coastal Urbanization:
 - Control of new urban development and their proximity to the coastline.
 - Control of waste management in coastal urbanizations (litter bins distribution, collection schedule and location of final waste disposal).
 - Promotion of prevention policies against waste generation (limitation of the single-use items and containers sale).
 - Promotion of recycling projects that generate added value from the reutilization of waste as new materials (Circular Economy).
- Tourism:
 - Control of waste generation in hotels, commercial, and recreational facilities. Incentives for the prevention of waste generation.
 - Promoting the elimination of single-use products in hotels, commercial, and recreational activities sectors.
 - Incentives for the creation of practices related to collection and recycling of the waste generated by hotels and commercial facilities.
- Fishing:
 - Education and awareness of the fisheries sector regarding the environmental improvement (e.g. zero waste into seas).
 - Promotion of “Fishing for litter” activities among the fishing fleet.
 - Education and awareness of the stakeholders regarding the benefits achieved by the removal of marine litter from the environment (practices improvements derived from the habitat improvements of the commercial target species, reduction of vessel accidents and breakdowns due to the presence of marine litter).
 - Promoting the implementation of storage areas for marine litter collection in ports.

- Agriculture:
 - Education and awareness of the stakeholders about the benefits derived from proper waste management.
 - Promoting the creation of waste management systems derived from agricultural practices.

Annex I
Matrixes of Interactions Between Elements of the ICZM Protocol and Principal Activities
Affecting Marine Litter Generation at Regional/Sub-Regional Levels

Table I: Matrix of interactions between elements of the ICZM Protocol and Principal activities affecting marine litter generation, Mediterranean Sea.

Overall of Pressure-Impact (Ecosystem Services) at the ICZM (%) 22,0

Economic (Driver)	LANDWARD - INLAND					COASTAL AREA					SEAWARD - LAGOONS - ISLANDS - OFFSHORE				
	Pressure	State	Impact (Ecosystem)	IMPACT SCORE	% of total impact	Pressure	State	Impact (Ecosystem)	IMPACT SCORE	% of total impacts	Pressure	State	Impact (Ecosystem)	IMPACT SCORE	% of total impacts
	Activity type				11,9	Activity type				24,0	Activity type				26,7
1) Agriculture	Crops (any)	Hydrological alterations	River diversions	Habitats deterioration		Crops (any)	Runoff/River (organochlorinated and other chemicals)	Coastal contamination/pollution	Habitats deterioration seafood contamination		Crops (effects seaward)	Runoff/River (organochlorinated and other chemicals)	Coastal and offshore contamination/pollution	Ecosystems deterioration Seafood contamination	
	Crops (any)	Geomorphological changes	Land alteration	Loss of biodiversity/ Population (species) decreases	3	Crops (any)	Runoff (river litter)	Coastal litter occurrence (beach, surface and seabed)	Species threaten Natural resources affected Landscape visual impairment	3	Crops (effects seaward)	Runoff (river litter)	Coastal litter occurrence (surface, water column, seabed and deep-sea bed)	Long-lived species threaten Natural resources affected Marine ecosystems deterioration	3
	Land crops	Land use	Land degradation	Soil degradation (contaminated, inert)		Crops (any)	Seaward sediment flux alterations	Coastal erosion	Coastal surface decrease (beaches, dunes, etc.)		Crops (effects seaward)	Seaward sediment flux alterations	Subsidence, unsustainable coastline	Loss of coastline	
	Wetland crops	Wetlands use	Wetlands degradation	Flooding vulnerability / Clean water provision		Deltaic crops	Delta use	Delta degradation (contaminated, inert)	Exploited resources affected		Crops (harvesting)	Coastal micro- and macro algae harvesting	Habitat alterations	Natural resources affected	
2) Industry (land-based sources)	Diverse Industrial Activities	Land use	Land occupation/loss	Habitats deterioration	2	Diverse Industrial Activities	Industrial wastewater (treated and untreated)	Transitional and coastal water pollution	Chemical and emerging contamination of habitats and species (water column and seabed)	2	Diverse Industrial Activities	Diffuse contamination	Coastal and offshore contamination	Pelagic and benthic ecosystem deterioration Seafood contamination	2
		Landfills	Contaminated and littered land	Habitats loss			Litter increase	Riverine and coastal litter occurrence (surface, beach)	Species threaten Natural resources affected Coastal visual impairment			Litter pollution (spread)	Coastal and offshore contamination (surface, water column, seabed, deep-sea bed)	Long-lived species threaten Natural resources affected Marine ecosystems deterioration	
		Residues (industrial effluents)	Contaminated land and rivers	Soil and water pollution			Industrial effluents (occasional inputs, acute events)	Transitional and coastal water pollution	Natural resources loss			Sea disposal sites (authorized dumping)	Sea-floor habitats affected (integrity impaired)	Benthic ecosystem loss	
3) Aquaculture	Nurseries, inland aquaculture	Land use	Land alteration	Habitats deterioration biodiversity impaired		Coastal aquaculture (shellfish farming, fish farming)	Water column and seabed habitats impacted by substances	Eutrophication	Habitats deterioration biodiversity impaired	3	Coastal, offshore farming	Pelagic ecosystem impacted by substances	Eutrophication	Habitats deterioration biodiversity impaired	3
4) Fisheries		Port operations	Altered coastal area	Contamination/ Pollution (hotspot)	2	Fishing vessels (artisanal, trawling, etc.)	Pressures on fish stocks and benthic ecosystems	Marine fisheries decline (over-fishing)	Decrease on fish species of commercial importance	2	Fishing vessels (medium power, trawling, etc.)	Pressures on fish stocks and benthic ecosystems	Marine habitats decline	Decrease on fish species of ecological importance	2
						Extraction of genetic resources	Pressures on fish stocks and benthic ecosystems	Populations diversity impaired	Decrease on fisheries ecological function	0	Extraction of genetic resources	Pressures on fish stocks and benthic ecosystems	Populations diversity impaired	Decrease on fisheries ecological function	0

5) Tourism, sporting, recreational activities	Urban development	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment	3	Urban/Real-state development	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment	3	Urban/Real-state development (only lagoons, islands, etc.)	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment		
		Landfills	Contaminated and littered land	Degradation of natural resources			Landfills	Contaminated and littered land	Degradation of natural resources Landscape visual impairment			Landfills	Contaminated and littered land	Degradation of natural resources Landscape visual impairment		
		Land urban expansion	Land degradation	Habitat loss Biodiversity loss Physical loss			Coastal urban expansion	Coastal degradation	Land-sea interface habitat loss and biodiversity loss			Coastal urban expansion	Coastal degradation	Land-sea interface habitat loss and biodiversity loss		
		Increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired			Increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired			Increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired		
						Scuba-diving activities	Pressures on habitats and functions maintenance (extraction of fish and shellfish)	Sea-floor habitats decline	Alteration on habitats and species of economical ecological importance			Scuba-diving activities (only lagoons, islands, etc.)	Pressures on habitats and functions maintenance (extraction of fish and shellfish)	Sea-floor habitats decline	Alteration on habitats and species of economical ecological importance	
						Fishing vessels (recreational)	Pressures on fish stocks	Water column habitats (species) decline	Decrease on fish species of ecological and commercial importance			Fishing vessels (recreational)	Pressures on fish stocks	Water column habitats (species) decline	Decrease on fish species of ecological and commercial importance	
						Tourism frequentation	Pressures on coastline (beaches, natural areas, etc.)	Increased pollution	Coastal areas degradation Habitats alteration Physical loss	3		Tourism frequentation (only lagoons, islands, etc.)	Pressures on coastline (beaches, natural areas, etc.)	Increased pollution	Coastal areas degradation Habitats alteration	3
						Yatching	Coastal areas navigation, contamiation, noise	Increased pollution (biological, chemical litter)	Coastal areas degradation Habitats alteration	3		Yatching	Coastal areas navigation, contamiation, noise	Increased pollution (biological, chemical litter)	Coastal areas degradation Habitats alteration	3
	Tourism facilities	Land changes	Land alteration	Loss of biodiversity/ Population (species) decreases		Tourism facilities	Coastal changes	Land alteration	Loss of biodiversity/ Population (species) decreases			Tourism facilities (only lagoons, islands, etc.)	Coastal changes	Land alteration	Loss of biodiversity/ Population (species) decreases	
	Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired		Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired Physical loss			Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired	
6) Utilization of specific natural resources						Seabed mining	Extraction of seabed substrate	Habitats deterioration	Integrity of sea-floor impaired	1		Seabed mining	Extraction of seabed substrate	Habitats and deep-habitats deterioration	Integrity of sea-floor impaired	1
						Desalinization	Uptake of seawater /release of brine and brackish waters	Habitats deterioration	Integrity of sea-floor and water column impaired	1		Desalinization	Uptake of seawater /release of brine and brackish waters	Habitats deterioration	Integrity of sea-floor and water column impaired	1
7) Infrastructure, energy facilities, ports and maritime works and structures	Transport (roads, highways)	Atmospheric emissions (gases and particles, CO ₂ , NO _x , VOCs, dust)	Degradation of air quality	Land/Soil use (irreversible loss)		Port/Harbour developments	Land/coastal changes	Degradation of coastal vegetation	Loss of coastal integrity (by erosion)							
		Soil contamination	Degradation of land	Ecological fragmentation of the territory			Waste generation (litter, waste port facilities, effluents)	Coastal fragmentation	Biodiversity (natural) impaired Ecological connectivity loss							

		Noise	Degradation of vegetation and forestry	Habitats loss			Risk of acute pollution events/accidents (hazardous substances, oil)	Water column and seabed habitats decline Biodiversity loss	Natural resources loss Endemic species threatened						
		Hydrological alterations	River diversions	Habitats deterioration			Inputs of nutrients and organic matter enrichment	Loss of endemic species/habitats	resources loss						
		Geomorphological changes	Land alteration	Loss of biodiversity/ Population (species) decreases			Microbiological pollution	Occurrence of pathogens	Degraded bathing water quality						
	Transport (railway)	Soil contamination	Degradation of land	Land/Soil use (irreversible loss)		Port/Marinas developments	Land/coastal change (roads, real-estate)	Degradation of coastal vegetation	Loss of coastal area integrity (by erosion)						
		Noise	Degradation of air quality	Ecological fragmentation of the territory			Waste generation (litter, waste port facilities, effluents)	Coastal fragmentation	Biodiversity (natural) impaired Ecological connectivity loss						
		Hydrological changes	Degradation of vegetation	Habitats loss			Risk of acute pollution events/accidents (hazardous substances, oil)	Water column and seabed habitats decline Biodiversity loss	Natural resources loss Endemic species threatened						
		Geomorphologic alterations	Fragmentation of territory	Natural resources loss			Inputs of nutrients and organic matter enrichment	Loss of endemic species/habitats	resources loss						
				Altered ecosystem functions			Microbiological pollution	Occurrence of pathogens	Degraded bathing water quality						
	Land artificialization	Land changes	Land loss	Ecological fragmentation of the territory and forestry loss		Underwater cables and pipelines	Wiring operations disturbance	Habitats decline	Loss of habitats and species	0	Underwater cables	Wiring operations disturbance	Habitats decline	Loss of habitats and species	1
	Water damming	Land changes, downward flow interrupted	Ecological flows impaired	Coastal regression and habitats loss		Oil and gas exploration	Exploraiton disturbances (airguns)	Water column habitats decline	Loss of species, stranding of long-lived species	2	Oil and gas exploration	Exploration disturbances (airguns)	Water column habitats decline	Loss of species, stranding of long-lived species	2
	River ports	Land changes, downward flow interrupted	Ecological flows impaired	Coastal regression and habitats loss							islands, lagoon ports/marinas	Coastal changes, downward flows interrupted	Degradation of coastal environments	Physical loss and habitats loss	
8) Maritime activities						Awaiting-anchoring areas (oil tankers, cargo transport, hazardous substances vessels)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline		Awaiting areas (oil tankers, cargo transport, hazardous substances vessels)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	
							Risk of accidents and spills	Water quality degradation	Coastal environment impacted			Risk of accidents and spills	Water quality degradation	Coastal and marine environment impacted	
						Bunkering	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline		Bunkering	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	
							Risk of accidents and spills	Water quality degradation				Risk of accidents and spills	Water quality degradation		
						Offshore platforms (oil and gas exploitation)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	2	Offshore platforms (oil and gas exploitation)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	2

							Risk of accidents and spills	Water quality degradation	Healthy coastal water and habitats decline			Risk of accidents and spills	Water quality degradation			
						Shipping traffic (commercial, ferries, military, cruise liners)	Introduction of pollutants and noise, litter	Water column habitats decline	Healthy coastal water and habitats decline	2		Shipping traffic (commercial, ferries, military, cruise liners)	Introduction of pollutants and noise, litter	Water column habitats decline	Healthy coastal water and habitats decline	2
							Risk of accidents or acute spills	Water quality degradation	Healthy coastal water and habitats decline				Risk of accidents or acute spills	Water quality degradation	Healthy coastal water and habitats decline	
							Introduction of NIS (ballastwater)	Biodiversity and functions alteration	Healthy coastal water and habitats decline				Introduction of NIS (ballastwater)	Biodiversity and functions alteration	Healthy coastal water and habitats decline	
						Dredging (natural environments)	Extraction of soil substrates	Disturbance of sea-floor integrity impaired	Benthic species and habitats deterioration	1		Dredging (natural environments)	Extraction of soil substrates	Disturbance of sea-floor integrity impaired	Benthic species and habitats deterioration	1
						Offshore energy (renewable)	Occupation of coastal marine space	Surface and pelagic ecosystems altered	Healthy coastal water and habitats decline	0		Offshore energy (renewable)	Occupation of coastal marine space	Surface and pelagic ecosystems altered	Healthy coastal water and habitats decline	0
						Solid waste disposal	Asfixiation of benthic habitats	Habitats and species loss	Healthy coastal benthic habitats decline	3		Solid waste disposal	Asfixiation of benthic habitats	Habitats and species loss	Healthy coastal benthic habitats decline	3
						Storage of gases	Substrate storage (seismic risks)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	1		Storage of gases	Substrate storage (seismic risks)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	0
						Defence operations	Noise, contamination and waste material	Coastal and marine environment threatened	Healthy coastal water and habitats decline	1		Defence operations	Noise, contamination and waste material	Coastal and marine environment threatened	Healthy coastal water and habitats decline	0
						Disposal of munition	Dumping of munitions (including bacteriological)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	3		Disposal of munition	Dumping of munitions (including bacteriological)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	3
					TOTAL INLAND IMPACT (Ecosystem Services)	10			TOTAL COASTAL IMPACT (Ecosystem services)	36				TOTAL SEAWARD IMPACT (Ecosystem services)	32	

Table II: Matrix of interactions between elements of the ICZM Protocol and Principal activities affecting marine litter generation on Western Mediterranean

Overall of Pressure-Impact (Ecosystem Services) at the ICZM (%) 16,4

Economic (Driver)	LANDWARD - INLAND				IMPACT SCORE	COASTAL AREA				IMPACT SCORE	SEAWARD - LAGOONS - ISLANDS - OFFSHORE				IMPACT SCORE
	Activity type	Pressure	State	Impact (Ecosystem)		% of total impact	Activity type	Pressure	State		Impact (Ecosystem)	% of total impacts	Activity type	Pressure	
					6,0					17,3					22,5
1) Agriculture	Crops (any)	Hydrological alterations	River diversions	Habitats deterioration		Crops (any)	Runoff/River (organochlorinated and other chemicals)	Coastal contamination/pollution	Habitats deterioration seafood contamination		Crops (effects seaward)	Runoff/River (organochlorinated and other chemicals)	Coastal and offshore contamination/pollution	Ecosystems deterioration Seafood contamination	
	Crops (any)	Geomorphological changes	Land alteration	Loss of biodiversity/ Population (species) decreases		Crops (any)	Runoff (river litter)	Costal litter occurrence (beach, surface and seabed)	Species threaten Natural resources affected Landscape visual impairment	3	Crops (effects seaward)	Runoff (river litter)	Costal litter occurrence (surface, water column, seabed and deep-sea bed)	Long-lived species threaten Natural resources affected Marine ecosystems deterioration	3
	Land crops	Land use	Land degradation	Soil degradation (contaminated, inert)		Crops (any)	Seaward sediment flux alterations	Coastal erosion	Coastal surface decrease (beaches, dunes, etc.)		Crops (effects seaward)	Seaward sediment flux alterations	Subsidence, unsustainable costaline	Loss of costaline	
	Wetland crops	Wetlands use	Wetlands degradation	Flooding vulnerability / Clean water provision		Deltaic crops	Delta use	Delta degradation (contaminated, inert)	Exploited resources affected		Crops (harvesting)	Coastal micro- and macro algae harvesting	Habitat alterations	Natural resources affected	
2) Industry (land-based sources)	Diverse Industrial Activities	Land use	Land occupation/loss	Habitats deterioration		Diverse Industrial Activities	Industrial wastewater (treated and untreated)	Transitional and coastal water pollution	Chemical and emerging contamination of habitats and species (water column and seafloor)	2	Diverse Industrial Activities	Diffuse contamination	Coastal and offshore contamination	Pelagic and benthic ecosystem deterioration Seafood contamination	3
		Landfills	Contaminated and littered land	Habitats loss	2		Litter increase	Riverine and coastal litter occurrence (surface, beach)	Species threaten Natural resources affected Coastal visual impairment	2		Litter pollution (spread)	Coastal and offshore contamination (surface, water column, seabed, deep-sea bed)	Long-lived species threaten Natural resources affected Marine ecosystems deterioration	2
		Residues (industrial effluents)	Contaminated land and rivers	Soil and water pollution			Industrial effluents (ocasional inputs, acute events)	Transitional and coastal water pollution	Natural resources loss			Sea disposal sites (authorized dumping)	Sea-floor habitats affected (integrity impaired)	Benthic ecosystem loss	
3) Aquaculture	Nurseries, inland aquaculture	Land use	Land alteration	Habitats deterioration biodiversity impaired		Costal aquaculture (shellfish farming, Fish farming)	Water column and seabed habitats impacted by substances	Eutrophication	Habitats deterioration biodiversity impaired		Coastal, offshore farming	Pelagic ecosystem impacted by substances	Eutrophication	Habitats deterioration biodiversity impaired	
4) Fisheries		Port operations	Altered coastal area	Contamination/ Pollution (hotspot)		Fishing vessels (artisanal, trawling, etc.)	Pressures on fish stocks and benthic ecosystems	Marine fisheries decline (over-fishing)	Decrease on fish species of comercial importance	2	Fishing vessels (medium power, trawling, etc.)	Pressures on fish stocks and benthic ecosystems	Marine habitats decline	Decrease on fish species of ecological importance	3

						Extraction of genetic resources	Pressures on fish stocks and benthic ecosystems	Populations diversity impaired	Decrease on fisheries ecological function		Extraction of genetic resources	Pressures on fish stocks and benthic ecosystems	Populations diversity impaired	Decrease on fisheries ecological function	
5) Tourism, sporting, recreational activities	Urban development	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment	3	Urban/Real-state development	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment	3	Urban/Real-state development (only lagoons, islands, etc.)	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment	3
		Landfills	Contaminated and littered land	Degradation of natural resources			Landfills	Contaminated and littered land	Degradation of natural resources Landscape visual impairment	3		Landfills	Contaminated and littered land	Degradation of natural resources Landscape visual impairment	3
		Land urban expansion	Land degradation	Habitat loss Biodiversity loss Physical loss			Coastal urban expansion	Coastal degradation	Land-sea interface habitat loss and biodiversity loss	3		Coastal urban expansion	Coastal degradation	Land-sea interface habitat loss and biodiversity loss	3
		Increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired			Increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired			Increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired	
						Scuba-diving activities	Pressures on habitats and functions maintenance (extraction of fish and shellfish)	Sea-floor habitats decline	Alteration on habitats and species of economical ecological importance		Scuba-diving activities (only lagoons, islands, etc.)	Pressures on habitats and functions maintenance (extraction of fish and shellfish)	Sea-floor habitats decline	Alteration on habitats and species of economical ecological importance	
						Fishing vessels (recreational)	Pressures on fish stocks	Water column habitats (species) decline	Decrease on fish species of ecological and commercial importance		Fishing vessels (recreational)	Pressures on fish stocks	Water column habitats (species) decline	Decrease on fish species of ecological and commercial importance	
						Tourism frequentation	Pressures on coastline (beaches, natural areas, etc.)	Increased pollution	Coastal areas degradation Habitats alteration Physical loss	3	Tourism frequentation (only lagoons, islands, etc.)	Pressures on coastline (beaches, natural areas, etc.)	Increased pollution	Coastal areas degradation Habitats alteration	3
						Yatching	Coastal areas navigation, contamiantion, noise	Increased pollution (biological, chemical, litter)	Coastal areas degradation Habitats alteration		Yatching	Coastal areas navigation, contamiantion, noise	Increased pollution (biological, chemical, litter)	Coastal areas degradation Habitats alteration	
	Tourism facilities	Land changes	Land alteration	Loss of biodiversity/ Population (species) decreases		Tourism facilities	Coastal changes	Land alteration	Loss of biodiversity/ Population (species) decreases		Tourism facilities (only lagoons, islands, etc.)	Coastal changes	Land alteration	Loss of biodiversity/ Population (species) decreases	
	Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired		Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired Physical loss		Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired	
6) Utilization of specific natural resources						Seabed mining	Extraction of seabed substrate	Habitats deterioration	Integrity of sea-floor impaired		Seabed mining	Extraction of seabed substrate	Habitats and deep-habitats deterioration	Integrity of sea-floor impaired	

						Desalination	Uptake of seawater /release of brine and brackish waters	Habitats deterioration	Integrity of sea-floor and water column impaired		Desalination	Uptake of seawater /release of brine and brackish waters	Habitats deterioration	Integrity of sea-floor and water column impaired
7) Infrastructure, energy facilities, ports and maritime works and structures	Transport (roads, highways)	Atmospheric emissions (gases and particles, CO _x , NO _x , VOCs, dust)	Degradation of air quality	Land/Soil use (irreversible loss)		Port/Harbour developments	Land/coastal changes	Degradation of coastal vegetation	Loss of coastal integrity (by erosion)					
		Soil contamination	Degradation of land	Ecological fragmentation of the territory			Waste generation (litter, waste port facilities, effluents)	Coastal fragmentation	Biodiversity (natural) impaired Ecological connectivity loss					
		Noise	Degradation of vegetation and forestry	Habitats loss			Risk of acute pollution events/accidents (hazardous substances, oil)	Water column and seabed habitats decline Biodiversity loss	Natural resources loss Endemic species threatened					
		Hydrological alterations	River diversions	Habitats deterioration			inputs of nutrients and organic matter enrichment	Loss of endemic species/habitats	resources loss					
		Geomorphological changes	Land alteration	Loss of biodiversity/ Population (species) decreases			Microbiological pollution	Occurrence of pathogens	Degraded bathing water quality					
	Transport (railway)	Soil contamination	Degradation of land	Land/Soil use (irreversible loss)		Port/Marinas developments	Land/coastal change (roads, real estate)	Degradation of coastal vegetation	Loss of coastal area integrity (by erosion)					
		Noise	Degradation of air quality	Ecological fragmentation of the territory			Waste generation (litter, waste port facilities, effluents)	Coastal fragmentation	Biodiversity (natural) impaired Ecological connectivity loss					
		Hydrological changes	Degradation of vegetation	Habitats loss			Risk of acute pollution events/accidents (hazardous substances, oil)	Water column and seabed habitats decline Biodiversity loss	Natural resources loss Endemic species threatened					
		Geomorphologic alterations	Fragmentation of territory	Natural resources loss			inputs of nutrients and organic matter enrichment	Loss of endemic species/habitats	resources loss					
				Altered ecosystem functions			Microbiological pollution	Occurrence of pathogens	Degraded bathing water quality					
	Land artificialization	Land changes	Land loss	Ecological fragmentation of the territory and forestry loss		Underwater cables and pipelines	Wiring operations disturbance	Habitats decline	Loss of habitats and species		Underwater cables	Wiring operations disturbance	Habitats decline	Loss of habitats and species
	Water damming	Land changes, downward flow interrupted	Ecological flows impaired	Coastal regression and habitats loss		Oil and gas exploration	Exploraiton disturbances (airguns)	Water column habitats decline	Loss of species, stranding of long-lived species		Oil and gas exploration	Exploration disturbances (airguns)	Water column habitats decline	Loss of species, stranding of long-lived species
	River ports	Land changes, downward flow interrupted	Ecological flows impaired	Coastal regression and habitats loss							islands, lagoon ports/marinas	Coastal changes, downward flows interrupted	Degradation of coastal environments	Physical loss and habitats loss

8) Maritime activities						Awaiting-anchoring areas (oil tankers, cargo transport, hazardous substances vessels)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline		Awaiting areas (oil tankers, cargo transport, hazardous substances vessels)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	
							Risk of accidents and spills	Water quality degradation	Coastal environment impacted			Risk of accidents and spills	Water quality degradation	Coastal and marine environment impacted	
						Bunkering	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline		Bunkering	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	
							Risk of accidents and spills	Water quality degradation				Risk of accidents and spills	Water quality degradation		
						Offshore platforms (oil and gas exploitation)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline		Offshore platforms (oil and gas exploitation)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	
							Risk of accidents and spills	Water quality degradation	Healthy coastal water and habitats decline			Risk of accidents and spills	Water quality degradation		
						Shipping traffic (commercial, ferries, military, cruise liners)	Introduction of pollutants and noise, litter	Water column habitats decline	Healthy coastal water and habitats decline	3	Shipping traffic (commercial, ferries, military, cruise liners)	Introduction of pollutants and noise, litter	Water column habitats decline	Healthy coastal water and habitats decline	2
							Risk of accidents or acute spills	Water quality degradation	Healthy coastal water and habitats decline			Risk of accidents or acute spills	Water quality degradation	Healthy coastal water and habitats decline	
							Introduction of NIS (ballastwater)	Biodiversity and functions alteration	Healthy coastal water and habitats decline			Introduction of NIS (ballastwater)	Biodiversity and functions alteration	Healthy coastal water and habitats decline	
						Dredging (natural environments)	Extraction of soil substrates	Disturbance of sea-floor integrity impaired	Benthic species and habitats deterioration		Dredging (natural environments)	Extraction of soil substrates	Disturbance of sea-floor integrity impaired	Benthic species and habitats deterioration	
						Offshore energy (renewable)	Occupation of coastal marine space	Surface and pelagic ecosystems altered	Healthy coastal water and habitats decline		Offshore energy (renewable)	Occupation of coastal marine space	Surface and pelagic ecosystems altered	Healthy coastal water and habitats decline	
						Solid waste disposal	Asfixiation of benthic habitats	Habitats and species loss	Healthy coastal benthic habitats decline	2	Solid waste disposal	Asfixiation of benthic habitats	Habitats and species loss	Healthy coastal benthic habitats decline	2
						Storage of gases	Substrate storage (seismic risks)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline		Storage of gases	Substrate storage (seismic risks)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	
						Defence operations	Noise, contamination and waste material	Coastal and marine environment threatened	Healthy coastal water and habitats decline		Defence operations	Noise, contamination and waste material	Coastal and marine environment threatened	Healthy coastal water and habitats decline	

						Disposal of munition	Dumping of munitions (including bacteriological)	Disturbance of sea- floor integrity impaired	Healthy coastal benthic habitats decline		Disposal of munition	Dumping of munitions (including bacteriological)	Disturbance of sea- floor integrity impaired	Healthy coastal benthic habitats decline	
				TOTAL INLAND IMPACT (Ecosystem Services)	5				TOTAL COASTAL IMPACT (Ecosystem services)	26				TOTAL SEAWARD IMPACT (Ecosystem services)	27

Table III: Matrix of interactions between elements of the ICZM Protocol and Principal activities affecting marine litter generation, Adriatic Sea.

Overall of Pressure-Impact (Ecosystem Services) at the ICZM (%) 32,2

Economic (Driver)	LANDWARD - INLAND				IMPACT SCORE	COASTAL AREA				IMPACT SCORE	SEAWARD - LAGOONS - ISLANDS - OFFSHORE				IMPACT SCORE
	Activity type	Pressure	State	Impact (Ecosystem))	% of total impact	Activity type	Pressure	State	Impact (Ecosystem)	% of total impacts	Activity type	Pressure	State	Impact (Ecosystem)	% of total impacts
					23,8					30,0					40,8
1) Agriculture	Crops (any)	Hydrological alterations	River diversions	Habitats deterioration		Crops (any)	Runoff/River (organochlorinated and other chemicals)	Coastal contamination/pollution	Habitats deterioration seafood contamination		Crops (effects seaward)	Runoff/River (organochlorinated and other chemicals)	Coastal and offshore contamination/pollution	Ecosystems deterioration Seafood contamination	
	Crops (any)	Geomorphological changes	Land alteration	Loss of biodiversity/ Population (species) decreases	3	Crops (any)	Runoff (river litter)	Costal litter occurrence (beach, surface and seabed)	Species threaten Natural resources affected Landscape visual impairment	3	Crops (effects seaward)	Runoff (river litter)	Costal litter occurrence (surface, water column, seabed and deep-sea bed)	Long-lived species threaten Natural resources affected Marine ecosystems deterioration	3
	Land crops	Land use	Land degradation	Soil degradation (contaminated, inert)	3	Crops (any)	Seaward sediment flux alterations	Coastal erosion	Coastal surface decrease (beaches, dunes, etc.)	3	Crops (effects seaward)	Seaward sediment flux alterations	Subsidence, unsustainable costaline	Loss of coastline	3
	Wetland crops	Wetlands use	Wetlands degradation	Flooding vulnerability / Clean water provision	3	Deltaic crops	Delta use	Delta degradation (contaminated, inert)	Exploited resources affected	3	Crops (harvesting)	Coastal micro- and macro algae harvesting	Habitat alterations	Natural resources affected	3
2) Industry (land-based sources)	Diverse Industrial Activities	Land use	Land occupation/ loss	Habitats deterioration	3	Diverse Industrial Activities	Industrial wastewater (treated and untreated)	Transitional and coastal water pollution	Chemical and emerging contamination of habitats and species (water column and seabed)	3	Diverse Industrial Activities	Diffuse contamination	Coastal and offshore contamination	Pelagic and benthic ecosystem deterioration Seafood contamination	3
		Landfills	Contaminated and littered land	Habitats loss	3		Litter increase	Riverine and coastal litter occurrence (surface, beach)	Species threaten Natural resources affected Coastal visual impairment	3		Litter pollution (spread)	Coastal and offshore contamination (surface, water column, seabed, deep-sea bed)	Long-lived species threaten Natural resources affected Marine ecosystems deterioration	3
		Residues (industrial effluents)	Contaminated land and rivers	Soil and water pollution			Industrial effluents (occasional inputs, acute events)	Transitional and coastal water pollution	Natural resources loss			Sea disposal sites (auhtorized dumping)	Sea-floor habitats affected (integrity impaired)	Benthic ecosystem loss	
3) Aquaculture	Nurseries, inland aquaculture	Land use	Land alteration	Habitats deterioration biodiversity impaired		Costal aquaculture (shellfish farming, Fish farming)	Water column and seabed habitats impacted by substances	Eutrophication	Habitats deterioration biodiversity impaired	3	Coastal, offshore farming	Pelagic ecosystem impacted by substances	Eutrophication	Habitats deterioration biodiversity impaired	3
4) Fisheries		Port operations	Altered coastal area	Contamination/ Pollution (hotspot)	2	Fishing vessels (artisanal, trawling, etc.)	Pressures on fish stocks and benthic ecosystems	Marine fisheries decline (over-fishing)	Decrease on fish species of commercial importance	3	Fishing vessels (medium power, trawling, etc.)	Pressures on fish stocks and benthic ecosystems	Marine habitats decline	Decrease on fish species of ecological importance	3
						Extraction of genetic resources	Pressures on fish stocks and benthic ecosystems	Populations diversity impaired	Decrease on fisheries ecological function	0	Extraction of genetic resources	Pressures on fish stocks and benthic ecosystems	Populations diversity impaired	Decrease on fisheries ecological function	0

5) Tourism, sporting, recreational activities	Urban development	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment	3	Urban/Real-state development	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment	3	Urban/Real-state development (only lagoons, islands, etc.)	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment	3	
		Landfills	Contaminated and littered land	Degradation of natural resources			Landfills	Contaminated and littered land	Degradation of natural resources Landscape visual impairment			Landfills	Contaminated and littered land	Degradation of natural resources Landscape visual impairment		
		Land urban expansion	Land degradation	Habitat loss Biodiversity loss Physical loss			Coastal urban expansion	Coastal degradation	Land-sea interface habitat loss and biodiversity loss	3		Coastal urban expansion	Coastal degradation	Land-sea interface habitat loss and biodiversity loss	3	
		Increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired			Increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired			Increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired		
						Scuba-diving activities	Pressures on habitats and functions maintenance (extraction of fish and shellfish)	Sea-floor habitats decline	Alteration on habitats and species of economical ecological importance			Scuba-diving activities (only lagoons, islands, etc.)	Pressures on habitats and functions maintenance (extraction of fish and shellfish)	Sea-floor habitats decline	Alteration on habitats and species of economical ecological importance	
						Fishing vessels (recreational)	Pressures on fish stocks	Water column habitats (species) decline	Decrease on fish species of ecological and commercial importance			Fishing vessels (recreational)	Pressures on fish stocks	Water column habitats (species) decline	Decrease on fish species of ecological and commercial importance	
						Tourism frequentation	Pressures on coastline (beaches, natural areas, etc.)	Increased pollution	Coastal areas degradation Habitats alteration Physical loss	3		Tourism frequentation (only lagoons, islands, etc.)	Pressures on coastline (beaches, natural areas, etc.)	Increased pollution	Coastal areas degradation Habitats alteration	3
						Yachting	Coastal areas navigation, contamination, noise	Increased pollution (biological, chemical litter)	Coastal areas degradation Habitats alteration	3		Yachting	Coastal areas navigation, contamination, noise	Increased pollution (biological, chemical litter)	Coastal areas degradation Habitats alteration	3
	Tourism facilities	Land changes	Land alteration	Loss of biodiversity/ Population (species)		Tourism facilities	Coastal changes	Land alteration	Loss of biodiversity/ Population (species) decreases			Tourism facilities (only lagoons, islands, etc.)	Coastal changes	Land alteration	Loss of biodiversity/ Population (species)	
	Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired		Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired Physical loss			Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired	
6) Utilization of specific natural resources						Seabed mining	Extraction of seabed substrate	Habitats deterioration	Integrity of sea-floor impaired	1		Seabed mining	Extraction of seabed substrate	Habitats and deep-floor deterioration	Integrity of sea-floor impaired	1
						Desalinization	Uptake of seawater /release of brine and brackish waters	Habitats deterioration	Integrity of sea-floor and water column impaired	0		Desalinization	Uptake of seawater /release of brine and brackish waters	Habitats deterioration	Integrity of sea-floor and water column impaired	1
7) Infrastructure, energy facilities, ports and maritime works and structures	Transport (roads, highways)	Atmospheric emissions (gases and particles, CO ₂ , NO _x , VOCs, dust)	Degradation of air quality	Land/Soil use (irreversible loss)		Port/Harbour developments	Land/coastal changes	Degradation of coastal vegetation	Loss of coastal integrity (by erosion)							
		Soil contamination	Degradation of land	Ecological fragmentation of the territory			Waste generation (litter, waste port facilities, effluents)	Coastal fragmentation	Biodiversity (natural) impaired Ecological connectivity loss							

		Noise	Degradation of vegetation and forestry	Habitats loss			Risk of acute pollution events/accidents (hazardous substances, oil)	Water column and seabed habitats decline Biodiversity loss	Natural resources loss Endemic species threatened						
		Hydrological alterations	River diversions	Habitats deterioration			Inputs of nutrients and organic matter enrichment	Loss of endemic species/habitats	resources loss						
		Geomorphological changes	Land alteration	Loss of biodiversity/ Population (species)			Microbiological pollution	Occurrence of pathogens	Degraded bathing water quality						
	Transport (railway)	Soil contamination	Degradation of land	Loss of biodiversity/ Population (species) <i>decreases</i> Land/soil use (irreversible loss)		Port/Marinas developments	Land/coastal change (roads, real-state)	Degradation of coastal vegetation	Loss of coastal area integrity (by erosion)						
		Noise	Degradation of air quality	Ecological fragmentation of the territory			Waste generation (litter, waste port facilities, effluents)	Coastal fragmentation	Biodiversity (natural) impaired Ecological connectivity loss						
		Hydrological changes	Degradation of vegetation	Habitats loss			Risk of acute pollution events/accidents (hazardous substances, oil)	Water column and seabed habitats decline Biodiversity loss	Natural resources loss Endemic species threatened						
		Geomorphologic alterations	Fragmentation of territory	Natural resources loss			Inputs of nutrients and organic matter enrichment	Loss of endemic species/habitats	resources loss						
				Altered ecosystem functions			Microbiological pollution	Occurrence of pathogens	Degraded bathing water quality						
	Land artificialization	Land changes	Land loss	Ecological fragmentation of the territory and forestry loss		Underwater cables and pipelines	Wiring operations disturbance	Habitats decline	Loss of habitats and species	0	Underwater cables	Wiring operations disturbance	Habitats decline	Loss of habitats and species	1
	Water damming	Land changes, downward flow interrupted	Ecological flows impaired	Coastal regression and habitats loss		Oil and gas exploration	Exploraiton disturbances (airguns)	Water column habitats decline	Loss of species, stranding of long-lived species	1	Oil and gas exploration	Exploration disturbances (airguns)	Water column habitats decline	Loss of species, stranding of long-lived species	1
	River ports	Land changes, downward flow interrupted	Ecological flows impaired	Coastal regression and habitats loss							Islands, lagoon ports/marinas	Coastal changes, downward flows interrupted	Degradation of coastal environments	Physical loss and habitats loss	
b) Maritime activities						Awaiting-anchoring areas (oil tankers, cargo transport, hazardous substances vessels)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline		Awaiting areas (oil tankers, cargo transport, hazardous substances vessels)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	
							Risk of accidents and spills	Water quality degradation	Coastal environment impacted			Risk of accidents and spills	Water quality degradation	Coastal and marine environment impacted	
						Bunkering	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline		Bunkering	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	
							Risk of accidents and spills	Water quality degradation				Risk of accidents and spills	Water quality degradation		
						Offshore platforms (oil and gas exploitation)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	1	Offshore platforms (oil and gas exploitation)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	1

						Risk of accidents and spills	Water quality degradation	Healthy coastal water and habitats decline			Risk of accidents and spills	Water quality degradation				
						Shipping traffic (commercial, ferries, military, cruise liners)	Introduction of pollutants and noise, litter	Water column habitats decline	Healthy coastal water and habitats decline	2		Shipping traffic (commercial, ferries, military, cruise liners)	Introduction of pollutants and noise, litter	Water column habitats decline	Healthy coastal water and habitats decline	3
							Risk of accidents or acute spills	Water quality degradation	Healthy coastal water and habitats decline				Risk of accidents or acute spills	Water quality degradation	Healthy coastal water and habitats decline	
							Introduction of NIS (ballastwater)	Biodiversity and functions alteration	Healthy coastal water and habitats decline				Introduction of NIS (ballastwater)	Biodiversity and functions alteration	Healthy coastal water and habitats decline	
						Dredging (natural environments)	Extraction of soil substrates	Disturbance of sea-floor integrity impaired	Benthic species and habitats deterioration	1		Dredging (natural environments)	Extraction of soil substrates	Disturbance of sea-floor integrity impaired	Benthic species and habitats deterioration	2
						Offshore energy (renewable)	Occupation of coastal marine space	Surface and pelagic ecosystems altered	Healthy coastal water and habitats decline	0		Offshore energy (renewable)	Occupation of coastal marine space	Surface and pelagic ecosystems altered	Healthy coastal water and habitats decline	0
						Solid waste disposal	Asfixiation of benthic habitats	Habitats and species loss	Healthy coastal benthic habitats decline	3		Solid waste disposal	Asfixiation of benthic habitats	Habitats and species loss	Healthy coastal benthic habitats decline	3
						Storage of gases	Substrate storage (seismic risks)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	0		Storage of gases	Substrate storage (seismic risks)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	0
						Defence operations	Noise, contamination and waste material	Coastal and marine environment threatened	Healthy coastal water and habitats decline	0		Defence operations	Noise, contamination and waste material	Coastal and marine environment threatened	Healthy coastal water and habitats decline	0
						Disposal of munition	Dumping of munitions (including bacteriological)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	3		Disposal of munition	Dumping of munitions (including bacteriological)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	3
						TOTAL INLAND IMPACT (Ecosystem Services)			TOTAL COASTAL IMPACT (Ecosystem services)	45					TOTAL SEAWARD IMPACT (Ecosystem services)	49

Table IV.- Matrix of interactions between elements of the ICZM Protocol and Principal activities affecting marine litter generation, Central Mediterranean.

Overall of Pressure-Impact (Ecosystem Services) at the ICZM (%) 23,4

Economic (Driver)	LANDWARD - INLAND				IMPACT SCORE	COASTAL AREA				IMPACT SCORE	SEAWARD - LAGOONS - ISLANDS - OFFSHORE				IMPACT SCORE
	Activity type	Pressure	State	Impact (Ecosystem)	% of total impact	Activity type	Pressure	State	Impact (Ecosystem)	% of total impacts	Activity type	Pressure	State	Impact (Ecosystem)	% of total impacts
					17,9					23,3					27,5
1) Agriculture	Crops (any)	Hydrological alterations	River diversions	Habitats deterioration		Crops (any)	Runoff/River (organochlorinated and other chemicals)	Coastal contamination/pollution	Habitats deterioration seafood contamination		Crops (effects seaward)	Runoff/River (organochlorinated and other chemicals)	Coastal and offshore contamination/pollution	Ecosystems deterioration Seafood contamination	
	Crops (any)	Geomorphological changes	Land alteration	Loss of biodiversity/ Population (species) decreases	3	Crops (any)	Runoff (river litter)	Coastal litter occurrence (beach, surface and seabed)	Species threaten Natural resources affected Landscape visual impairment	3	Crops (effects seaward)	Runoff (river litter)	Coastal litter occurrence (surface, water column, seabed and deep-sea bed)	Long-lived species threaten Natural resources affected Marine ecosystems deterioration	3
	Land crops	Land use	Land degradation	Soil degradation (contaminated, inert)	3	Crops (any)	Seaward sediment flux alterations	Coastal erosion	Coastal surface decrease (beaches, dunes, etc.)	3	Crops (effects seaward)	Seaward sediment flux alterations	Subsidence, unsustainable coastline	Loss of coastline	3
	Wetland crops	Wetlands use	Wetlands degradation	Flooding vulnerability / Clean water provision	3	Deltaic crops	Delta use	Delta degradation (contaminated, inert)	Exploited resources affected	3	Crops (harvesting)	Coastal micro- and macro algae harvesting	Habitat alterations	Natural resources affected	3
2) Industry (land-based sources)	Diverse industrial Activities	Land use	Land occupation/ loss	Habitats deterioration	2	Diverse industrial Activities	Industrial wastewater (treated and untreated)	Transitional and coastal water pollution	Chemical and emerging contamination of habitats and species (water column and seabed)	2	Diverse industrial Activities	Diffuse contamination	Coastal and offshore contamination	Pelagic and benthic ecosystem deterioration Seafood contamination	2
		Landfills	Contaminated and littered land	Habitats loss			Litter increase	Riverine and coastal litter occurrence (surface, beach)	Species threaten Natural resources affected Coastal visual impairment			Litter pollution (spread)	Coastal and offshore contamination (surface, water column, seabed, deep-sea bed)	Long-lived species threaten Natural resources affected Marine ecosystems deterioration	
		Residues (industrial effluents)	Contaminated land and rivers	Soil and water pollution			Industrial effluents (occasional inputs, acute events)	Transitional and coastal water pollution	Natural resources loss			Sea disposal sites (authorized dumping)	Sea-floor habitats affected (integrity impaired)	Benthic ecosystem loss	
3) Aquaculture	Nurseries, inland aquaculture	Land use	Land alteration	Habitats deterioration biodiversity impaired		Coastal aquaculture (shellfish farming, Fish farming)	Water column and seabed habitats impacted by substances	Eutrophication	Habitats deterioration biodiversity impaired	0	Coastal, offshore farming	Pelagic ecosystem impacted by substances	Eutrophication	Habitats deterioration biodiversity impaired	0
4) Fisheries		Port operations	Altered coastal area	Contamination/ Pollution (hotspot)	2	Fishing vessels (artisanal, trawling, etc.)	Pressures on fish stocks and benthic ecosystems	Marine fisheries decline (over-fishing)	Decrease on fish species of commercial importance	2	Fishing vessels (medium power, trawling, etc.)	Pressures on fish stocks and benthic ecosystems	Marine habitats decline	Decrease on fish species of ecological importance	2
						Extraction of genetic resources	Pressures on fish stocks and benthic ecosystems	Populations diversity impaired	Decrease on fisheries ecological function	0	Extraction of genetic resources	Pressures on fish stocks and benthic ecosystems	Populations diversity impaired	Decrease on fisheries ecological function	0

5) Tourism, sporting, recreational activities	Urban development	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment	2	Urban/Real-state development	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment	2	Urban/Real-state development (only lagoons, islands, etc.)	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment	2	
		Landfills	Contaminated and littered land	Degradation of natural resources			Landfills	Contaminated and littered land	Degradation of natural resources Landscape visual impairment			Landfills	Contaminated and littered land	Degradation of natural resources Landscape visual impairment		
		Land urban expansion	Land degradation	Habitat loss Biodiversity loss Physical loss			Coastal urban expansion	Coastal degradation	Land-sea interface habitat loss and biodiversity loss			Coastal urban expansion	Coastal degradation	Land-sea interface habitat loss and biodiversity loss		
		Increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired			Increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired			Increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired		
						Scuba-diving activities	Pressures on habitats and functions maintenance (extraction of fish and shellfish)	Sea-floor habitats decline	Alteration on habitats and species of economical ecological importance			Scuba-diving activities (only lagoons, islands, etc.)	Pressures on habitats and functions maintenance (extraction of fish and shellfish)	Sea-floor habitats decline	Alteration on habitats and species of economical ecological importance	
						Fishing vessels (recreational)	Pressures on fish stocks	Water column habitats (species) decline	Decrease on fish species of ecological and commercial importance			Fishing vessels (recreational)	Pressures on fish stocks	Water column habitats (species) decline	Decrease on fish species of ecological and commercial importance	
						Tourism frequentation	Pressures on coastline (beaches, natural areas, etc.)	Increased pollution	Coastal areas degradation Habitats alteration Physical loss	3		Tourism frequentation (only lagoons, islands, etc.)	Pressures on coastline (beaches, natural areas, etc.)	Increased pollution	Coastal areas degradation Habitats alteration	3
						Yatching	Coastal areas navigation, contamination, noise	Increased pollution (biological, chemical litter)	Coastal areas degradation Habitats alteration	3		Yatching	Coastal areas navigation, contamination, noise	Increased pollution (biological, chemical litter)	Coastal areas degradation Habitats alteration	3
	Tourism facilities	Land changes	Land alteration	Loss of biodiversity/ Population (species) decreases		Tourism facilities	Coastal changes	Land alteration	Loss of biodiversity/ Population (species) decreases			Tourism facilities (only lagoons, islands, etc.)	Coastal changes	Land alteration	Loss of biodiversity/ Population (species) decreases	
	Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired		Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired Physical loss			Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired	
6) Utilization of specific natural resources						Seabed mining	Extraction of seabed substrate	Habitats deterioration	Integrity of sea-floor impaired	1		Seabed mining	Extraction of seabed substrate	Habitats and deep-habitats deterioration	Integrity of sea-floor impaired	1
						Desalinization	Uptake of seawater /release of brine and brackish waters	Habitats deterioration	Integrity of sea-floor and water column impaired	1		Desalinization	Uptake of seawater /release of brine and brackish waters	Habitats deterioration	Integrity of sea-floor and water column impaired	1
7) Infrastructure, energy facilities, ports and maritime works and structures	Transport (roads, highways)	Atmospheric emissions (gases and particles, CO ₂ , NO _x , VOCs, dust)	Degradation of air quality	Land/Soil use (irreversible loss)		Port/Harbour developments	Land/coastal changes	Degradation of coastal vegetation	Loss of coastal integrity (by erosion)							
		Soil contamination	Degradation of land	Ecological fragmentation of the territory			Waste generation (litter, waste port facilities, effluents)	Coastal fragmentation	Biodiversity (natural) impaired Ecological connectivity loss							

		Noise	Degradation of vegetation and forestry	Habitats loss			Risk of acute pollution events/accidents (hazardous substances, oil)	Water column and seabed habitats decline Biodiversity loss	Natural resources loss Endemic species treathened							
		Hydrological alterations	River diversions	Habitats deterioration			Inputs of nutrients and organic matter enrichment	Loss of endemic species/habitats	resources loss							
		Geomorphological changes	Land alteration	Loss of biodiversity/ Population (species) decreases			Microbiological pollution	Occurrence of pathogens	Degraded bathing water quality							
	Transport (railway)	Soil contamination	Degradation of land	Land/Soil use (irreversible loss)		Port/Marinas developments	Land/coastal change (roads, real-estate)	Degradation of coastal vegetation	Loss of coastal area integrity (by erosion)							
		Noise	Degradation of air quality	Ecological fragmentation of the territory			Waste generation (litter, waste port facilities, effluents)	Coastal fragmentation	Biodiversity (natural) impaired Ecological connectivity loss							
		Hydrological changes	Degradation of vegetation	Habitats loss			Risk of acute pollution events/accidents (hazardous substances, oil)	Water column and seabed habitats decline Biodiversity loss	Natural resources loss Endemic species treathened							
		Geomorphologic alterations	Fragmentation of territory	Natural resources loss			Inputs of nutrients and organic matter enrichment	Loss of endemic species/habitats	resources loss							
				Altered ecosystem functions			Microbiological pollution	Occurrence of pathogens	Degraded bathing water quality							
	Land artificialization	Land changes	Land loss	Ecological fragmentation of the territory and forestry loss		Underwater cables and pipelines	Wiring operations disturbance	Habitats decline	Loss of habitats and species	0		Underwater cables	Wiring operations disturbance	Habitats decline	Loss of habitats and species	0
	Water damming	Land changes, downward flow interrupted	Ecological flows impaired	Coastal regresion and habitats loss		Oil and gas exploration	Exploraiton disturbances (airguns)	Water column habitats decline	Loss of species, stranding of long-lived species	2		Oil and gas exploration	Exploration disturbances (airguns)	Water column habitats decline	Loss of species, stranding of long-lived species	1
	River ports	Land changes, downward flow interrupted	Ecological flows impaired	Coastal regresion and habitats loss								Islands, lagoon ports/marinas	Coastal changes, downward flows interrupted	Degradation of coastal environments	Physical loss and habitats loss	
8) Maritime activities						Awaiting-anchoring areas (oil tankers, cargo transport, hazardous substances vessels)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline			Awaiting areas (oil tankers, cargo transport, hazardous substances vessels)	introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	
							Risk of accidents and spills	Water quality degradation	Coastal environment impacted				Risk of accidents and spills	Water quality degradation	Coastal and marine environment impacted	
						Bunkering	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline			Bunkering	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	
							Risk of accidents and spills	Water quality degradation					Risk of accidents and spills	Water quality degradation		
						Offshore platforms (oil and gas exploitation)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	2		Offshore platforms (oil and gas exploitation)	introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	1

							Risk of accidents and spills	Water quality degradation	Healthy coastal water and habitats decline			Risk of accidents and spills	Water quality degradation			
						Shipping traffic (commercial, ferries, military, cruise liners)	Introduction of pollutants and noise, litter	Water column habitats decline	Healthy coastal water and habitats decline	2		Shipping traffic (commercial, ferries, military, cruise liners)	Introduction of pollutants and noise, litter	Water column habitats decline	Healthy coastal water and habitats decline	2
							Risk of accidents or acute spills	Water quality degradation	Healthy coastal water and habitats decline				Risk of accidents or acute spills	Water quality degradation	Healthy coastal water and habitats decline	
							Introduction of NIS (ballastwater)	Biodiversity and functions alteration	Healthy coastal water and habitats decline				Introduction of NIS (ballastwater)	Biodiversity and functions alteration	Healthy coastal water and habitats decline	
						Dredging (natural environments)	Extraction of soil substrates	Disturbance of sea-floor integrity impaired	Benthic species and habitats deterioration	0		Dredging (natural environments)	Extraction of soil substrates	Disturbance of sea-floor integrity impaired	Benthic species and habitats deterioration	0
						Offshore energy (renewable)	Occupation of coastal marine space	Surface and pelagic ecosystems altered	Healthy coastal water and habitats decline	0		Offshore energy (renewable)	Occupation of coastal marine space	Surface and pelagic ecosystems altered	Healthy coastal water and habitats decline	0
						Solid waste disposal	Asfixiation of benthic habitats	Habitats and species loss	Healthy coastal benthic habitats decline	3		Solid waste disposal	Asfixiation of benthic habitats	Habitats and species loss	Healthy coastal benthic habitats decline	3
						Storage of gases	Substrate storage (seismic risks)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	0		Storage of gases	Substrate storage (seismic risks)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	0
						Defence operations	Noise, contamination and waste material	Coastal and marine environment threatened	Healthy coastal water and habitats decline	0		Defence operations	Noise, contamination and waste material	Coastal and marine environment threatened	Healthy coastal water and habitats decline	0
						Disposal of munition	Dumping of munitions (including bacteriological)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	3		Disposal of munition	Dumping of munitions (including bacteriological)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	3
				TOTAL INLAND IMPACT (Ecosystem Services)	15				TOTAL COASTAL IMPACT (Ecosystem services)	35					TOTAL SEAWARD IMPACT (Ecosystem services)	33

Table V: Matrix of interactions between elements of the ICZM Protocol and Principal activities affecting marine litter generation, Eastern Mediterranean.

Overall of Pressure-Impact (Ecosystem Services) at the ICZM (%) **23,2**

Economic (Driver)	LANDWARD - INLAND				IMPACT SCORE	COASTAL AREA				IMPACT SCORE	SEAWARD - LAGOONS - ISLANDS - OFFSHORE				IMPACT SCORE
	Activity type	Pressure	State	Impact (Ecosystem))	% of total impact	Activity type	Pressure	State	Impact (Ecosystem)	% of total impacts	Activity type	Pressure	State	Impact (Ecosystem)	% of total impacts
					13,1					24,7					28,3
1) Agriculture	Crops (any)	Hydrological alterations	River diversions	Habitats deterioration		Crops (any)	Runoff/River (organochlorinated and other chemicals)	Coastal contamination/pollution	Habitats deterioration seafood contamination		Crops (effects seaward)	Runoff/River (organochlorinated and other chemicals)	Coastal and offshore contamination/pollution	Ecosystems deterioration Seafood contamination	
	Crops (any)	Geomorphological changes	Land alteration	Loss of biodiversity/ Population (species) decreases	3	Crops (any)	Runoff (river litter)	Coastal litter occurrence (beach, surface and seabed)	Species threaten Natural resources affected Landscape visual impairment	3	Crops (effects seaward)	Runoff (river litter)	Coastal litter occurrence (surface, water column, seabed and deep-sea bed)	Long-lived species threaten Natural resources affected Marine ecosystems deterioration	3
	Land crops	Land use	Land degradation	Soil degradation (contaminated, inert)		Crops (any)	Seaward sediment flux alterations	Coastal erosion	Coastal surface decrease (beaches, dunes, etc.)		Crops (effects seaward)	Seaward sediment flux alterations	Subsidence, unsustainable coastline	Loss of coastline	
	Wetland crops	Wetlands use	Wetlands degradation	Flooding vulnerability / Clean water provision		Deltaic crops	Delta use	Delta degradation (contaminated, inert)	Exploited resources affected		Crops (harvesting)	Coastal micro- and macro algae harvesting	Habitat alterations	Natural resources affected	
2) Industry (land-based sources)	Diverse Industrial Activities	Land use	Land occupation/ loss	Habitats deterioration	3	Diverse Industrial Activities	Industrial wastewater (treated and untreated)	Transitional and coastal water pollution	Chemical and emerging contamination of habitats and species (water column and seabed)	3	Diverse Industrial Activities	Diffuse contamination	Coastal and offshore contamination	Pelagic and benthic ecosystem deterioration Seafood contamination	3
		Landfills	Contaminated and littered land	Habitats loss			Litter increase	Riverine and coastal litter occurrence (surface, beach)	Species threaten Natural resources affected Coastal visual impairment			Litter pollution (spread)	Coastal and offshore contamination (surface, water column, seabed, deep-sea bed)	Long-lived species threaten Natural resources affected Marine ecosystems deterioration	
		Residues (industrial effluents)	Contaminated land and rivers	Soil and water pollution			Industrial effluents (occasional inputs, acute events)	Transitional and coastal water pollution	Natural resources loss			Sea disposal sites (authorized dumping)	Sea-floor habitats affected (integrity impaired)	Benthic ecosystem loss	
3) Aquaculture	Nurseries, inland aquaculture	Land use	Land alteration	Habitats deterioration biodiversity impaired		Coastal aquaculture (shellfish farming, Fish farming)	Water column and seabed habitats impacted by substances	Eutrophication	Habitats deterioration biodiversity impaired	0	Coastal, offshore farming	Pelagic ecosystem impacted by substances	Eutrophication	Habitats deterioration biodiversity impaired	0
4) Fisheries		Port operations	Altered coastal area	Contamination/ Pollution (hotspot)	2	Fishing vessels (artisanal, trawling, etc.)	Pressures on fish stocks and benthic ecosystems	Marine fisheries decline (over-fishing)	Decrease on fish species of commercial importance	2	Fishing vessels (medium power, trawling, etc.)	Pressures on fish stocks and benthic ecosystems	Marine habitats decline	Decrease on fish species of ecological importance	2
						Extraction of genetic resources	Pressures on fish stocks and benthic ecosystems	Populations diversity impaired	Decrease on fisheries ecological function	0	Extraction of genetic resources	Pressures on fish stocks and benthic ecosystems	Populations diversity impaired	Decrease on fisheries ecological function	0

5) Tourism, sporting, recreational activities	Urban development	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment	3	Urban/Real-state development	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment	3	Urban/Real-state development (only lagoons, islands, etc.)	Waste generation (litter, wastewater treatment plants) Urban effluents Microbiological pollution	Degradation of land, air and water sources Occurrence of pathogens	Soil, habitats and coastal forestry loss Bathing water quality detriment		
		Landfills	Contaminated and littered land	Degradation of natural resources			Landfills	Contaminated and littered land	Degradation of natural resources Landscape visual impairment			Landfills	Contaminated and littered land	Degradation of natural resources Landscape visual impairment		
		Land urban expansion	Land degradation	Habitat loss Biodiversity loss Physical loss			Coastal urban expansion	Coastal degradation	Land-sea interface habitat loss and biodiversity loss			Coastal urban expansion	Coastal degradation	Land-sea interface habitat loss and biodiversity loss		
		increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired			increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired			increased nutrients	Eutrophication	Habitats deterioration biodiversity impaired		
						Scuba-diving activities	Pressures on habitats and functions maintenance (extraction of fish and shellfish)	Sea-floor habitats decline	Alteration on habitats and species of economical ecological importance			Scuba-diving activities (only lagoons, islands, etc.)	Pressures on habitats and functions maintenance (extraction of fish and shellfish)	Sea-floor habitats decline	Alteration on habitats and species of economical ecological importance	
						Fishing vessels (recreational)	Pressures on fish stocks	Water column habitats (species) decline	Decrease on fish species of ecological and commercial importance			Fishing vessels (recreational)	Pressures on fish stocks	Water column habitats (species) decline	Decrease on fish species of ecological and commercial importance	
						Tourism frequentation	Pressures on coastline (beaches, natural areas, etc.)	Increased pollution	Coastal areas degradation Habitats alteration Physical loss	3		Tourism frequentation (only lagoons, islands, etc.)	Pressures on coastline (beaches, natural areas, etc.)	Increased pollution	Coastal areas degradation Habitats alteration	3
						Yatching	Coastal areas navigation, contamiation, noise	Increased pollution (biological, chemical, litter)	Coastal areas degradation Habitats alteration	3		Yatching	Coastal areas navigation, contamiation, noise	Increased pollution (biological, chemical, litter)	Coastal areas degradation Habitats alteration	3
	Tourism facilities	Land changes	Land alteration	Loss of biodiversity/ Population (species) decrease		Tourism facilities	Coastal changes	Land alteration	Loss of biodiversity/ Population (species) decreases			Tourism facilities (only lagoons, islands, etc.)	Coastal changes	Land alteration	Loss of biodiversity/ Population (species) decrease	
	Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired		Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired Physical loss			Other small scale activities	Waste generation (litter, waste treatment plants, effluents)	Degradation of coastal environments	Coastal resources integrity impaired	
6) Utilization of specific natural resources						Seabed mining	Extraction of seabed substrate	Habitats deterioration	Integrity of sea-floor impaired	2		Seabed mining	Extraction of seabed substrate	Habitats and deep-floor deterioration	Integrity of sea-floor impaired	2
						Desalinization	Uptake of seawater /release of brine and brackish waters	Habitats deterioration	Integrity of sea-floor and water column impaired	2		Desalinization	Uptake of seawater /release of brine and brackish waters	Habitats deterioration	Integrity of sea-floor and water column impaired	2
7) Infrastructure, energy facilities, ports and maritime works and structures	Transport (roads, highways)	Atmospheric emissions (gases and particles, CO _x , NO _x , VOCs, dust)	Degradation of air quality	Land/Soil use (irreversible loss)		Port/Harbour developments	Land/coastal changes	Degradation of coastal vegetation	Loss of coastal integrity (by erosion)							
		Soil contamination	Degradation of land	Ecological fragmentation of the territory			Waste generation (litter, waste port facilities, effluents)	Coastal fragmentation	Biodiversity (natural) impaired Ecological connectivity loss							

		Noise	Degradation of vegetation and forestry	Habitats loss			Risk of acute pollution events/accidents (hazardous substances, oil)	Water column and seabed habitats decline Biodiversity loss	Natural resources loss Endemic species threatened							
		Hydrological alterations	River diversions	Habitats deterioration			inputs of nutrients and organic matter enrichment	Loss of endemic species/habitats	resources loss							
		Geomorphological changes	Land alteration	Loss of biodiversity/ Population (species) decreases			Microbiological pollution	Occurrence of pathogens	Degraded bathing water quality							
	Transport (railway)	Soil contamination	Degradation of land	Land/Soil use (irreversible loss)		Port/Marinas developments	Land/coastal change (roads, real-state)	Degradation of coastal vegetation	Loss of coastal area integrity (by erosion)							
		Noise	Degradation of air quality	Ecological fragmentation of the territory			Waste generation (litter, waste port facilities, effluents)	Coastal fragmentation	Biodiversity (natural) impaired Ecological connectivity loss							
		Hydrological changes	Degradation of vegetation	Habitats loss			Risk of acute pollution events/accidents (hazardous substances, oil)	Water column and seabed habitats decline Biodiversity loss	Natural resources loss Endemic species threatened							
		Geomorphologic alterations	Fragmentation of territory	Natural resources loss			inputs of nutrients and organic matter enrichment	Loss of endemic species/habitats	resources loss							
				Altered ecosystem functions			Microbiological pollution	Occurrence of pathogens	Degraded bathing water quality							
	Land artificialization	Land changes	Land loss	Ecological fragmentation of the territory and forestry loss		Underwater cables and pipelines	Wiring operations disturbance	Habitats decline	Loss of habitats and species	1		Underwater cables	Wiring operations disturbance	Habitats decline	Loss of habitats and species	1
	Water damming	Land changes, downward flow interrupted	Ecological flows impaired	Coastal regression and habitats loss		Oil and gas exploration	Exploraiton disturbances (airguns)	Water column habitats decline	Loss of species, stranding of long-lived species	2		Oil and gas exploration	Exploration disturbances (airguns)	Water column habitats decline	Loss of species, stranding of long-lived species	2
	River ports	Land changes, downward flow interrupted	Ecological flows impaired	Coastal regression and habitats loss								Islands, lagoon ports/marinas	Coastal changes, downward flows interrupted	Degradation of coastal environments	Physical loss and habitats loss	
8) Maritime activities						Awaiting-anchoring areas (oil tankers, cargo transport, hazardous substances vessels)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline			Awaiting areas (oil tankers, cargo transport, hazardous substances vessels)	Introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	
							Risk of accidents and spills	Water quality degradation	Coastal environment impacted				Risk of accidents and spills	Water quality degradation	Coastal and marine environment impacted	
						Bunkering	introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline			Bunkering	introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	
							Risk of accidents and spills	Water quality degradation					Risk of accidents and spills	Water quality degradation		
						Offshore platforms (oil and gas exploitation)	introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	2		Offshore platforms (oil and gas exploitation)	introduction of pollutants (oil hydrocarbons and related organic compounds)	Water column habitats decline	Healthy coastal water and habitats decline	2

							Risk of accidents and spills	Water quality degradation	Healthy coastal water and habitats decline			Risk of accidents and spills	Water quality degradation					
							Shipping traffic (commercial, ferries, military, cruise liners)	Introduction of pollutants and noise, litter	Water column habitats decline	Healthy coastal water and habitats decline	2		Shipping traffic (commercial, ferries, military, cruise liners)	Introduction of pollutants and noise, litter	Water column habitats decline	Healthy coastal water and habitats decline	2	
								Risk of accidents or acute spills	Water quality degradation	Healthy coastal water and habitats decline				Risk of accidents or acute spills	Water quality degradation	Healthy coastal water and habitats decline		
								Introduction of NIS (ballastwater)	Biodiversity and functions alteration	Healthy coastal water and habitats decline				Introduction of NIS (ballastwater)	Biodiversity and functions alteration	Healthy coastal water and habitats decline		
							Dredging (natural environments)	Extraction of soil substrates	Disturbance of sea-floor integrity impaired	Benthic species and habitats deterioration	2		Dredging (natural environments)	Extraction of soil substrates	Disturbance of sea-floor integrity impaired	Benthic species and habitats deterioration	2	
							Offshore energy (renewable)	Occupation of coastal marine space	Surface and pelagic ecosystems altered	Healthy coastal water and habitats decline	0		Offshore energy (renewable)	Occupation of coastal marine space	Surface and pelagic ecosystems altered	Healthy coastal water and habitats decline	0	
							Solid waste disposal	Asfixiation of benthic habitats	Habitats and species loss	Healthy coastal benthic habitats decline	3		Solid waste disposal	Asfixiation of benthic habitats	Habitats and species loss	Healthy coastal benthic habitats decline	3	
							Storage of gases	Substrate storage (seismic risks)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	0		Storage of gases	Substrate storage (seismic risks)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	0	
							Defence operations	Noise, contamination and waste material	Coastal and marine environment threatened	Healthy coastal water and habitats decline	1		Defence operations	Noise, contamination and waste material	Coastal and marine environment threatened	Healthy coastal water and habitats decline	1	
							Disposal of munition	Dumping of munitions (including bacteriological)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	3		Disposal of munition	Dumping of munitions (including bacteriological)	Disturbance of sea-floor integrity impaired	Healthy coastal benthic habitats decline	3	
							TOTAL INLAND IMPACT (Ecosystem Services)				11						TOTAL COASTAL IMPACT (Ecosystem services)	37
																	TOTAL SEAWARD IMPACT (Ecosystem services)	34