PERSEUS

POLICY-ORIENTED MARINE ENVIRONMENTAL RESEARCH IN THE SOUTHERN EUROPEAN SEAS

MAJOR PRESSURES AND THEIR IMPACTS IN THE EASTERN MEDITERRANEAN SEA – ANALYSIS PERFORMED IN THE FRAMEWORK OF PERSEUS EU PROJEC

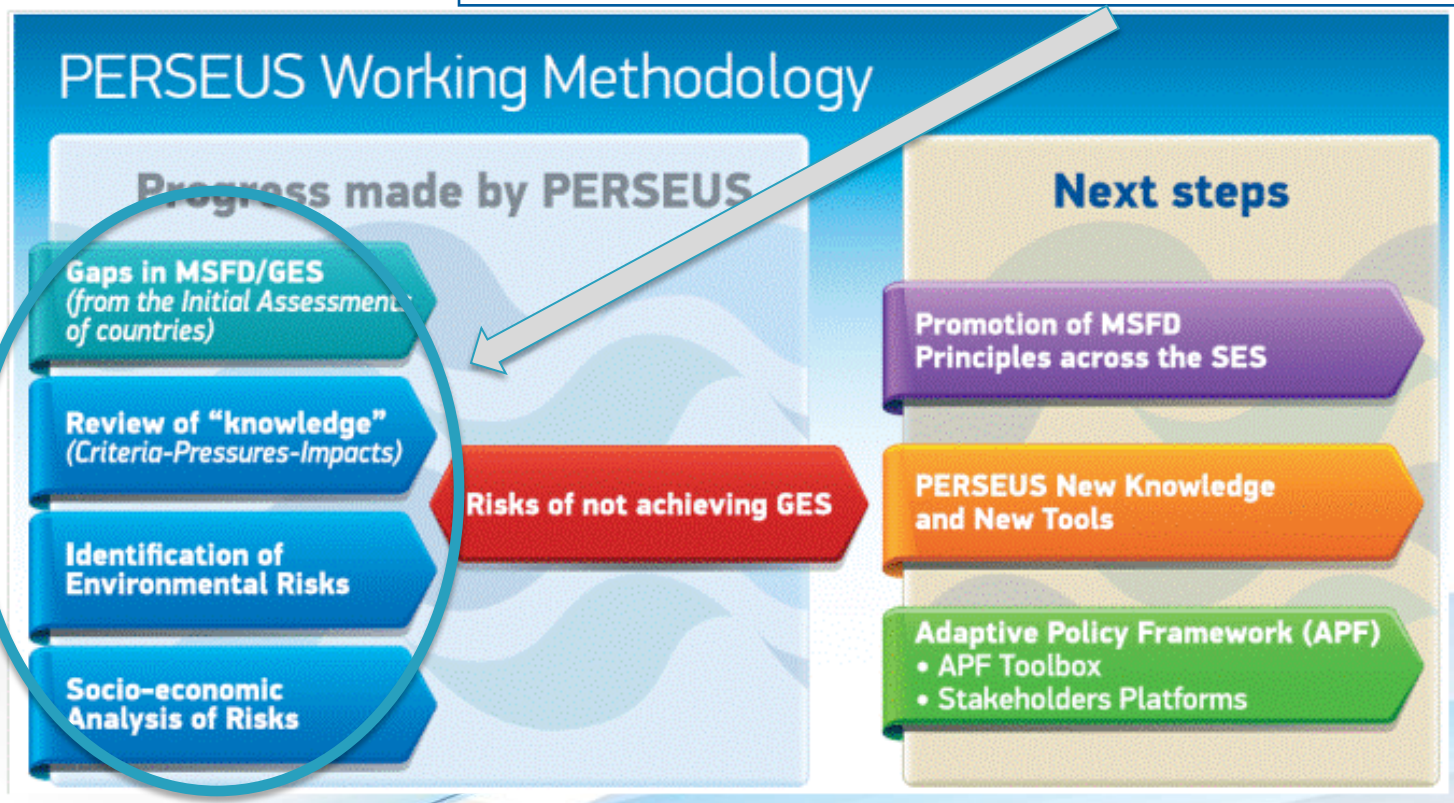
H. Kaberi, N. Streftaris, A. Karageorgis, E. Christou, D. Angel, C. Gucu, D. Sauzade and M. Skourtos

SEVENTH FRAMEWORK PROGRAMME

MARES 2020, 17-20 September 2013, Varna, Bulgaria

Through a methodological process of gap and impact analyses, PERSEUS has updated and prioritised the main environmental risks in relation to each of the 11 GES descriptors of the MSFD.

PERSEUS UMBRELLA WORKSHOP



Analysis for gaps on data and knowledge related to a list of key processes, pressures and impacts

OPEN Sea

- Hydro-meteorological variability
- Exchange fluxes at straits
- Pollution from maritime transport and other activities
- Atmospheric inputs
- Biological pressures (fisheries and non-indigenous species)

Coastal Areas

- Changes in freshwater and sediment riverine fluxes (D7)
- Nutrients and organic enrichment (D5)
- Contamination by hazardous substances (D8, D9)
- Physical damage and loss of habitats (D6)
- Biological disturbance: Introduction of non-indigenous species (D2)
- Biological disturbance: Extraction of species, including non-target catches (D3)
- Marine litter (D10)
- Underwater noise (D11)

Open sea

Alteration of hydrographical conditions

Major changes in the thermohaline circulation of the Eastern Mediterranean have been recorded in the 1990s (Eastern Mediterranean Transient). The hydrographical conditions are severely affected by the Black Sea Water inflow and its variability. Dense water formation and cascading is a major process regulating biogeochemical cycles. Local atmospheric conditions play an important role in those processes.

Chemical pollution

Source of chemical contamination are the atmospheric deposition, river inputs, submarine groundwater discharge, and maritime transport.
Atmospheric transport is an efficient transport route of emissions from land-based emission sources to offshore marine waters. The Eastern Mediterranean Sea is under a strong influence of Saharan dust events.
Pollution by maritime transport activities occurs during routine ship operations and on accidental events. Polycyclic aromatic hydrocarbons (PAHs) are amongst the most toxic persistent organic pollutants composing crude oil. They have together with Hg the most serious long-term environmental effects in water, sediment, and biota. Ship emissions to the atmosphere comprise PAHs, Hg, ozone, and aerosols precursors such as NOx, CO, volatile compounds (VOCs), SO_2 and the emission of greenhouse gases.

Open sea

Physical damage and loss of habitats
Trawling can alter the seafloor morphology, and also modify the physical properties of seafloor sediments.

Non-indigenous species. The EMED is exposed to a massive introduction of NIS immigrating naturally through the Suez Canal. Shipping is still the main way of primary and secondary introduction. NIS introduction is enhanced due to the increasing temperature.

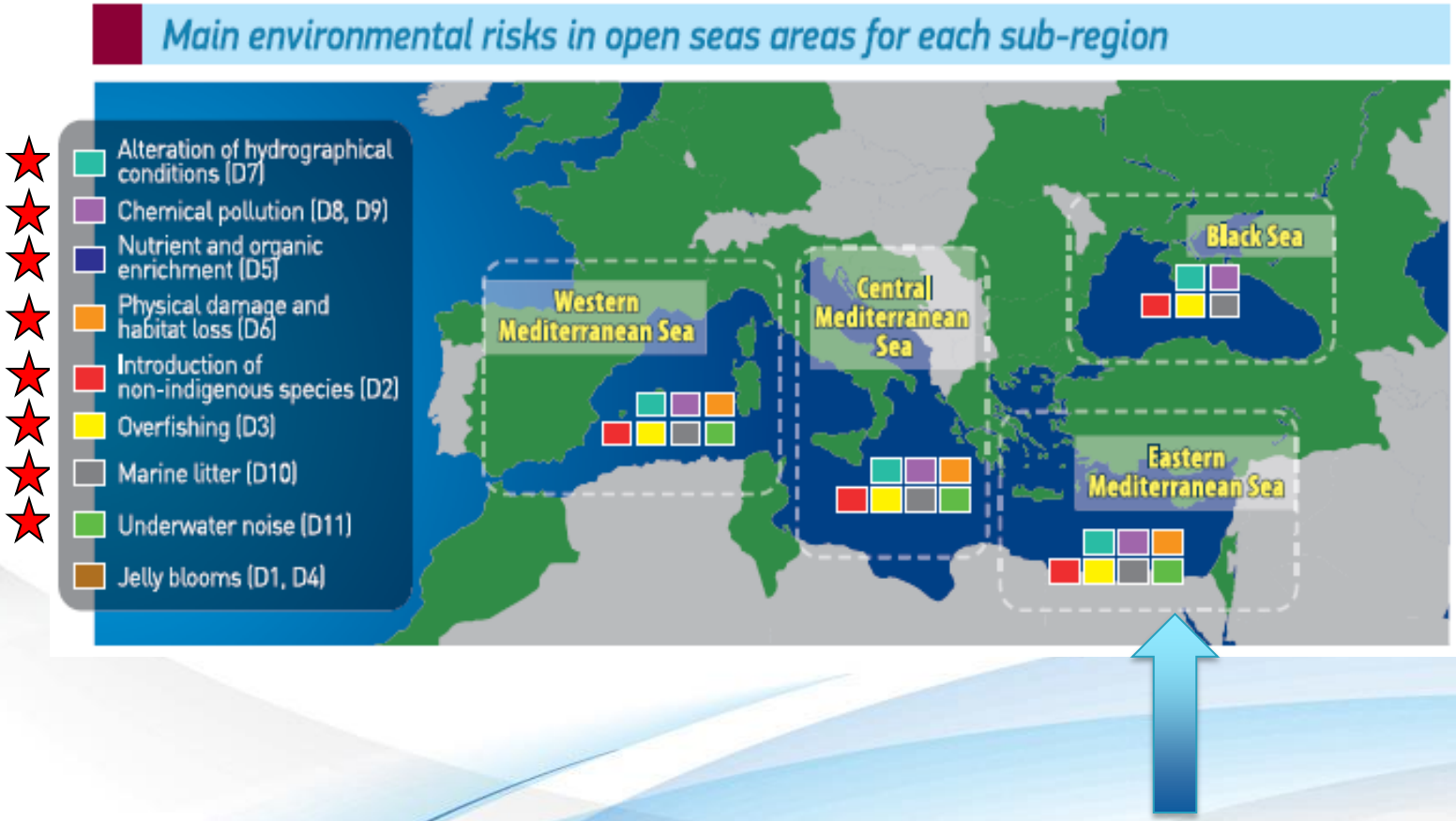
Over-fishing. The species: Thunnus thynnus, Merluccius merluccius, Parapenaeus longirostris, Sardina pilchardus and Xiphias gladius are considered to be overfished stocks. Four stocks (Engraulis encrasicolus, Spicara smaris, Mullus barbatus and Mullus surmuletus) were classified as sustainable.

Marine Litter. Sources of marine litter are related to shipping and transport of litter from the coastal areas. Microplastics deriving from the breakdown of larger plastic debris may have severe effects on marine organisms (marine mammals, turtles, fish), as they accumulate in their body.

Noise. The most important sources of anthropogenic underwater noise are the maritime traffic, seismic surveys, military activities, and drilling operations. Noise is increasingly being considered as a threat to marine mammals.

Open sea

Overall, this analysis showed that, for scientific data and knowledge, lack of data and long time series, and in many cases poorly constrained processes are the major gaps identified.



Coastal ecosystems

- Changes in freshwater and sediment riverine fluxes (D7)
- **Nutrients and organic enrichment (D5)**
- Contamination by hazardous substances (D8, D9)
- Physical damage and loss of habitats (D6)
- **Biological disturbance: Introduction of non-indigenous species (D2)**
- Biological disturbance: Extraction of species, including non-target catches (D3)
- **Marine litter (D10)**
- **Underwater noise (D11)**

Coastal ecosystems

Nutrients and organic enrichment (D5)

Gaps in data

-Regular monitoring of organic load discharges.
-Regular monitoring of net fluxes of nutrients by small effluents and treatment plants.

Gaps in knowledge

-The link between high nutrient load, phytoplankton response in terms of community structure and carbon transfer in the food web, HABs and mucilage production.

Pressure: Nutrients and organic enrichment

	Western Mediterranean				Transition zone		Adriatic Sea	Eastern Mediterranean	
Areas / Impact on:	Barcelona and the Spanish Mediterranean coast	Mediterranean coast of Morocco	The Rhone River and Marseille, the French Western Mediterranean Sea	Naples and the region of Campania	The strait of Sicily	The Gulf of Tunis	The Adriatic Sea	The Saronikos Gulf	Haifa, Israel
Plankton	**	*	**				**	**	***
Algae and seagrass	*	*	*	**			*	**	
Zoobenthos	*		*	*			*	**	
Fish	*	*	*				**	*	*
Sea turtles	*		**						
Marine mammals	*		*	**					
Seabirds	*	*	**						

Coastal ecosystems

Introduction of non-indigenous species (D2) - Main gaps

-Update list and distribution of alien species.
-The introduction of alien species via marine aquaculture activities either intentional or accidental.
-Non-indigenous plankton.
-The impact of invasive NIS on ecosystem functioning.
-Investigation of balance between positive effects for fisheries and negative impacts on ecosystems.

Pressure: Introduction of non-indigenous species

	Western Mediterranean				Transition zone		Adriatic Sea	Eastern Mediterranean	
Areas / Impact on:	Barcelona and the Spanish Mediterranean coast	Mediterranean coast of Morocco	The Rhone River and Marseille, the French Western Mediterranean Sea	Naples and the region of Campania	The strait of Sicily	The Gulf of Tunis	The Adriatic Sea	The Saronikos Gulf	Haifa, Israel
Plankton	*		*					**	
Algae and seagrass	**						**	**	**
Zoobenthos				**			**	**	**
Fish	*		*					*	**
Sea turtles									
Marine mammals									
Seabirds									

Coastal ecosystems

Marine litter (D10) - Main gaps

-Composition, distribution and origin of marine litter.
-The importance of dumping as source of chemical contamination.
-Impact of litter on the different components of the ecosystem.

Pressure: Marine litter

Impact on: \ Areas	Western Mediterranean				Transition zone		Adriatic Sea	Eastern Mediterranean	
	Barcelona and the Spanish Mediterranean coast	Mediterranean coast of Morocco	The Rhone River and Marseille, the French Western Mediterranean Sea	Naples and the region of Campania	The strait of Sicily	The Gulf of Tunis	The Adriatic Sea	The Saronikos Gulf	Haifa, Israel
Plankton	*		*					*	
Algae and seagrass			**					*	
Zoobenthos		*	**					*	
Fish	*	*	**					*	
Sea turtles	**	*	**				**		*
Marine mammals	**		*	*					*
Seabirds		*		**					

Pressure: Underwater noise

Impact on: \ Areas	Western Mediterranean				Transition zone		Adriatic Sea	Eastern Mediterranean	
	Barcelona and the Spanish Mediterranean coast	Mediterranean coast of Morocco	The Rhone River and Marseille, the French Western Mediterranean Sea	Naples and the region of Campania	The strait of Sicily	The Gulf of Tunis	The Adriatic Sea	The Saronikos Gulf	Haifa, Israel
Plankton	*		**						
Algae and seagrass	*		***				*		
Zoobenthos	*		**				*	*	
Fish	*		*				**		
Sea turtles									*
Marine mammals									*
Seabirds	*								

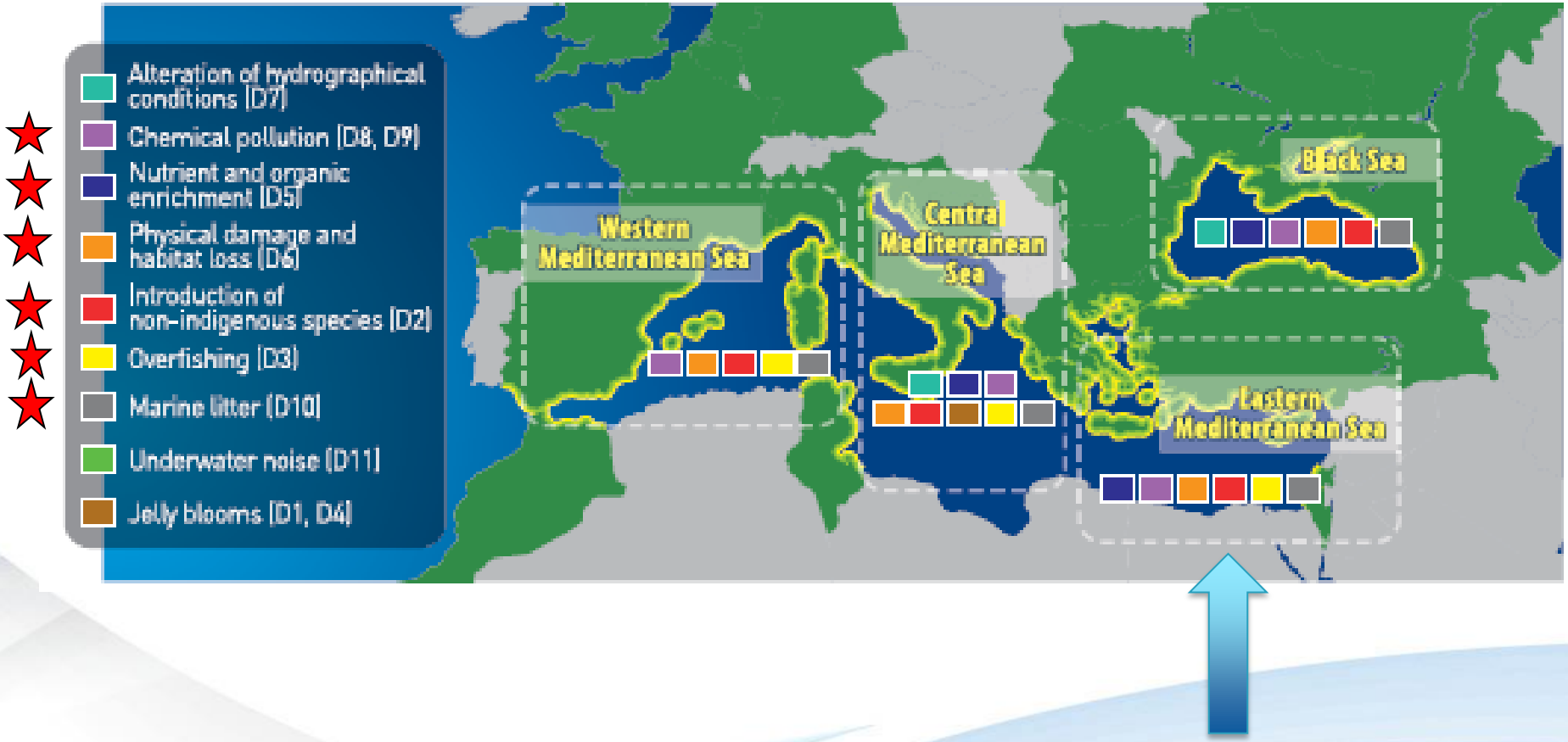
Underwater noise (D11) - Main gaps

-Distribution in time and place of sound levels.
-Short and long term impacts of the exposure to noise on biota, particularly on potentially vulnerably species like cetaceans and turtles.

Coastal ecosystems

PERSEUS
POLICY-ORIENTED MARINE ENVIRONMENTAL RESEARCH IN THE SOUTHERN EUROPEAN SEAS

Main environmental risks in coastal areas for each sub-region



Gap Analysis on data and knowledge

The scope of the socio economic analysis of pressures on the open and coastal waters follows accordingly the results of the preliminary analysis of issues at risk of non-achievement of GES in SES by focussing on the following marine sectors:

Marine sectors

- Fisheries
- Aquaculture
- Maritime transport and cruises
- Recreational activities, coastal tourism
- Submarine cable and pipeline operations
- Marine hydrocarbon (oil and gas) extraction

Studied parameters

- Production parameters
- Production value
- Gross value added (when possible)
- Employment

The **gap analysis** has shown that a significant part of required data to perform these assessments is missing or not publicly available, especially those needed to assess value added and employment wages as well as cost of degradation.

Preliminary identification of pressures in socio-economic terms

Example: Fisheries

PERSEUS
POLICY-ORIENTED MARINE ENVIRONMENTAL RESEARCH IN THE SOUTHERN EUROPEAN SEAS

A. Sector Analysis

Table 20. Landing statistics for the Aegean-Levantine Sea

	Coastal waters
	2010
Landings (1000 tonne)	212.75

Source: FAO STAT, 2012

Notes: Fishing areas includes the Aegean-Levantine Sea. Coastal water include Egypt, Greece, Israel, Lebanon, Palestinian Territories, Syria, and Turkey. O data for Cyprus (European Hake), Greece (European Hake and Norway (European Hake), Syria (European Hake), and Turkey (Norway Lobster).

Table 21. Sector statistics for the Aegean-Levantine Sea

	Greece	Cyprus	Egypt (Med)	Lebanon	Libya	Palestinian Territory	Israel			
	2008	2010	2008	2008	2008	2008	2008	2008	2008	2008
Landings (1000t)										
Fleet										
Vessels (nr)	17 657	1768	3124	2660	5029	717	438			
GT (1000)	84.4	4.7	n.a.	n.a.	n.a.	n.a.	n.a.			
kW (1000)	506.1	45.5	n.a.	n.a.	n.a.	n.a.	n.a.			
Effort										
Days at sea (1000)	2 721.4	75.6	n.a.	n.a.	n.a.	n.a.	n.a.			

Sources: FAO, 2012; EC, 2011; EC, 2012; Sacchi, 2011.

B. Economic Analysis

Table 22. Economic statistics for the Aegean-Levantine Sea (Million Euros)

	Greece	Cyprus	Egypt (Med)	Lebanon	Libya	Palestinian Territory	Israel	Syria	Tunisia	Turkey (Med)
	2008	2010	2008	2008	2008	2008	2008	2008	2008	2008
Landings value	544	10.2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Gross value added	n.a.	-5.7	270.5	n.a.	104.6	n.a.	12.7	184.9	115.1	16.2
Economic profit	n.a.	-7.12	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Source: EC, 2011; EC, 2012; Sacchi, 2011.

C. Social Analysis

Table 23. Social statistics for the Aegean-Levantine Sea

	Greece	Cyprus	Egypt (Med)	Lebanon	Libya	Palestinian Territory	Israel	Syria	Tunisia	Turkey (Med)
	2008	2010	2008	2008	2008	2008	2008	2008	2008	2008
Total employed	23 862	1 421	18 000	8 500	7 700	3 300	1 500	4 000	49 000	19 000
Full time equivalents	n.a.	910.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Source: EC, 2011; EC, 2012; Sacchi, 2011.

Preliminary identification of pressures in socio-economic terms

PERSEUS
POLICY-ORIENTED MARINE ENVIRONMENTAL RESEARCH IN THE SOUTHERN EUROPEAN SEAS

Environmental risks selected for adaptive policy framework case studies

Sub-regions	Western Mediterranean		Central Mediterranean		Eastern Mediterranean		Black Sea	
Main Risk	Coastal	Basin	Coastal	Basin	Coastal	Basin	Coastal	Basin
Alteration of hydrographical conditions (D7)		✖	✖	✖		✖	✖	✖
Chemical pollution (D8, D9)	✖	✖	✖	✖	✖	✖	✖	✖
Nutrient and organic enrichment (D5)			✖		✖		✖	
Physical damage and loss of habitats (D6)	✖	✖	✖	✖	✖	✖	✖	
Introduction of non-indigenous species (D2)	✖	✖	✖	✖	✖	✖	✖	✖
Overfishing (D3)	✖	✖	✖	✖	✖	✖		✖
Marine litter (D10)	✖	✖	✖	✖	✖	✖	✖	✖
Underwater noise (D11)		✖		✖		✖		
Jelly blooms (D1, D4)			✖					

✖ Risks found Risks selected for APF case studies

PERSEUS
POLICY-ORIENTED MARINE ENVIRONMENTAL RESEARCH IN THE SOUTHERN EUROPEAN SEAS

www.perseus-net.eu

Thank you!