Pilot Project - New Knowledge for an integrated management of human activities in the sea

First Deliverable

Outcomes of the cataloguing of current monitoring programmes and analysis of pressures

(01 / 10 / 2013 – 31 / 05 / 2015)

Final version

IRIS-SES

INTEGRATED REGIONAL MONITORING IMPLEMENTATION STRATEGY IN THE SOUTH EUROPEAN SEAS

www.iris-ses.eu

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Murciano Virto Carla, Sauzade Didier. Plan Bleu. **Socioeconomic assessment of human activities, analysis and trends of environmental pressures for the design of monitoring plans**. . In: *Outcomes of the cataloguing of current monitoring programmes and analysis of pressures - IRIS-SES project*. Pagou Kalliopi, Giannoudi Louisa, Streftaris Nikos (eds), IRIS-SES Project, May 2015.

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List of Acronyms

BAT	**Best Available Technologies**
BAU	**Business as Usual (Scenario)**
BEP	**Best Environmental Practices**
BSC	**Black Sea Commission**
BSIMAP	**Black Sea Integrated Monitoring and Assessment Programme**
CFP	**Common Fisheries Policy**
CP(s)	**Contracting Party(ies)**
EA	**Ecosystem Approach**
EC	**European Commission**
EcAp	**Mediterranean Action Plan's Ecosystem Approach Initiative**
EEZ	**Economic Exclusive Zone**
EO	**Ecological Objective**
EQS	**Environmental Quality Standards**
EU	**European Union**
EU MS	**European Union Member States**
GES	**Good Environmental Status**
GFCM	**General Fisheries Commission for the Mediterranean**
GVA	**Gross Value Added**
IMP	**Integrated Maritime Policy**
IA(s)	**Initial Assessment(s)**
JMP	**Joint Monitoring Programme**
MAP	**Mediterranean Action Plan**
MEA	**Millennium Ecosystem Assessment**
MSFD	**Marine Strategy Framework Directive**
WFD	**Water Framework Directive**
UN	**United Nations**

EXECUTIVE SUMMARY

The deliverable comprises of the results of the Activity 1 of the project IRIS-SES – Analysis of the monitoring programmes carried on the framework of the European/Regional/National, in relation to MSFD requirements. Initially, this activity had three tasks (T1.1a - The Inventory, T1.1b - The Database, T1.2 - Analysis of pressures and T1.3 - Assessment of the contribution of existing monitoring programmes to meet MSFD needs). The first Steering Committee decided to move T1.3 to Activity 2 - Integrating scales of monitoring with those of processes to be monitored, because it is better integrated within the tasks of that activity.

The first IRIS-SES deliverable consists of the catalogue (T1.1a) of the monitoring programmes carried on six MS countries: from Black Sea (Romania, Bulgaria) and from Mediterranean Sea (Greece, Cyprus, Italy, Spain) and one candidate country, Turkey (with monitoring both in the Black Sea and the Mediterranean Sea). Additionally, Croatia agreed to fill in the sheets with the monitoring programme inventory and this was done by the Institute of Oceanology and Fisheries from Split even if they were not partners in this project.

Thus, the catalogue has 8 Excel Files comprising of 17 sheets grouped as follows: D1,4,6 – Birds; D1,4,6 – Mammals;D1,4,6 – Fish; D1,4,6 – Seabed habitats Phytobenthos;D1,4,6 – Seabed habitat Zoobenthos; D1,4,6 – Water column habitats Phytoplankton; D1,4,6 – Water column habitat Zooplankton; D2 - Non-Indigenous species; D3 - Commercial Fish and Shellfish, D5 – Eutrophication; D7 – hydrographical changes; D8 – contaminants in water; D8-contaminants in sediments; D8-contaminants in biota; D9-contaminants in seafood; D10-marine litter; D11-energy&noise.

All the information from the catalogue was aggregated into one (meta-) database (T1.1b), consisting initially of one Excel file, planned to be compatible with larger oceanographic/environmental databases like SeaDataNet and EMODNET through the use of INSPIRE and SeaDataNet standards.

During the project, due to other activities requirements (particularly Activity 3) the meta-database was rebuilt in an ACCESS format, which is the final searchable version of it.

The analysis of pressures (T1.2) consists of the Inventory and critical assessment of international and regional legislation developed under two excel sheets including the review of significant regional and international regulatory bodies, which may contain monitoring obligations, and which may be linked to monitoring programmes already implemented by the countries beneficiaries of the IRIS-SES Project. Contact and consultation have been envisaged and made with Regional Activity Centers for the Mediterranean Action Plan (REMPEC, RAC-SPA), as well as with the MedPol Programme, who are responsible for the implementation of several of the Protocols to the Barcelona Convention. Similarly, in the context of the Bucharest Convention of the Black Sea, contact has been made with the Black Sea Commission.

Another content of the analysis of pressures is the socio-economic assessment of human activities, analysis of current and future environmental pressures, and gap analysis delivered through an excel file with three sheets containing:

- socio-economic characterization of principal human activities influencing marine ecosystems among the Mediterranean and the Black Sea countries (providing information on the *status quo* of human activities –drivers- impacting coastal and marine ecosystems of the IRIS-SES beneficiary countries. Therefore, official descriptive data and indicators characterizing the main socioeconomic activities have been gathered and presented). The analysis has been carried out for Bulgaria, Cyprus, France, Greece, Italy, Romania Slovenia, and Spain, according to the MSFD Initial Assessments delivered to the EC. In contrast, data are lacking for Malta, Croatia and Turkey regarding the analysis of economic activities influencing their marine environment. The socioeconomic section of Malta's IA is still not publicly available. Croatia, which recently accessed the EC, will join the second cycle of the MSFD. Finally, Turkey, as EU candidate state, has no reporting obligations on European directives.
- current and future pressures and impacts resulting from current and future human activities in the Mediterranean and the Black Seas. Future trends according to a BAU Scenario for the principal socioeconomic activities directly or closely linked to marine environments are detailed subsequently. These are provided for: Agriculture and forestry run-off; Coastal urbanization and development; Damming (Human demand for water

resources); Tourism frequentation and yachting; Desalination/ water abstraction; Land claim, coastal defence; Port operations; Submarine cable and pipeline operations; Shipping; Hydrocarbon extraction; Marine-based renewable energy generation; Fisheries and Aquaculture; Marine Research and Survey.

- considerations on the need for monitoring data to support future assessments and managerial actions - identifies data gaps and highlights monitoring needs regarding environmental pressures, in order to guide monitoring efforts and support the development of coherent future joint monitoring programmes. The assessment of data gaps/monitoring needs has been carried out in the third Excel sheet. Monitoring gaps regarding environmental pressures are in line with what has been observed for most of the data gaps on impacts and states of the marine environments in the Black Sea and the Mediterranean Sea. Most of the MSFD Descriptors and related pressure indicators appear at least partially described/addressed by one or more parameters measured on ongoing monitoring programmes. However, the partial description appears insufficient to state the magnitude of pressures impacting the marine ecosystems over the jurisdiction to which the MSFD applies.

According to what was decided during the first steering committee, the assessment for the contribution of the existing monitoring programmes to meet MSFD needs already reported was developed within Task 2.1 (instead within Task 1.3).

Summary of the First deliverable

Activity 1	Task	Action (Sub-task)	Parts of the deliverable
Analysis of the monitoring programmes carried on the framework of European/Regional/National legislation in relation to MSFD requirements	**1.Inventory of the monitoring programmes**	**1a.The Inventory**	• Description of the catalogue • Eight Excel files – MS monitoring programmes (Cyprus, Greece, Italy, Spain, Bulgaria, Romania, Turkey and Croatia) (Monitoring Programme Inventory_"country".xlsx)
		1b. The Database	• Description of the database • One Access file – IRIS_SES metadatabase
	2.Analysis of pressures	**1. An inventory and critical assessment of the legislation regulating the marine environment monitoring of Mediterranean and Black Seas, with a focus on supra national legal instruments (EU directives and Regulations, Regional Sea Conventions and their Protocols, other Regional and International Conventions).**	• One Excel file (1.2_IRIS_SES_Plan Bleu_AnalysisPressures _a.xlsx), containing two sheets (*Regional Convention-Legislation* and *International Conventions*)
		2. Gathering and assessing data on human activities and associated pressures and impacts to the marine environment.	• Description of the socio-economic assessment of human activities, analysis of current and future environmental pressures, and gap analysis (.docx and .pdf) • One Excel file (1.2_IRIS_SES_Plan Bleu_AnalysisPressures _bcd.xlsx) containing three sheets (*b) ESA Black & Med Seas; (c) Env. Pressures,Future Trends;* and (*d) Monitoring gaps*).
		3. Assessing future trends of the human activities leading to future environmental pressures.	
		4. Considering the need for monitoring data (i.e. addressing data gaps) to support future assessments and managerial actions.	

1. INTRODUCTION

The present deliverable results mainly from Activity 1 - Analysis of the monitoring programmes carried on the framework of European/Regional/National legislation in relation to the MSFD requirements of the project «Integrated Regional Implementation Strategy in the South European Seas (IRIS-SES) », with aims:

- To catalogue the current monitoring programmes in the Mediterranean and Black Sea (SES), in order to assess their contribution to meet the requirements of MSFD. As a draft, the catalogue will first incorporate the input of the project partners involved into it, grouped into two Regional Sea Conventions (Barcelona and Bucharest Conventions) and followed with updated information from partners and other MSs countries (Task 1.1a).
- To design a (meta-) database with the information from Task 1a. The meta-database contains the input by the project partners according to Task 1.1a. The meta-database it was updated with information from Croatia (Task 1.1b).
- To analyze the pressures by reviewing the data availability, regarding the range of pressures and associated human activities (including those under license requirements) related to the needs for an integrated monitoring of pressures (Task 1.2).

2. DESIGN OF THE CATALOGUE

The design of the catalogue took into consideration all MSFD descriptors, which were monitored only in EU and associate MSs involved in the project. The reporting sheets have been developed based on DIKE DG/2013/02 revised document “Reporting on monitoring programmes under MSFD Article 11” prepared by DG ENV D2 and MRAG on 18/06/2013 and the parameters sheets developed under the HELCOM (MORE project), and modified according to IRIS-SES needs. The compiled draft sheets were sent to the partners for consultation. After minor changes, the final sheets were sent to be filled (early January 2014).

The IRIS-SES project received the following information to compile into the catalogue and the meta-database:

	Croatia	Cyprus	Greece	Italy	Spain	Turkey	Bulgaria	Romania	Turkey
	UNEP/MAP						BSC		
Descriptors 1,4,6 - Birds	✓	✓	✓	✓	✓	✓	✓	✓	✓
Descriptors 1,4,6 - Mammals	✓	✓	✓	✓	✓	✓	✓	✓	✓
Descriptors 1,4,6 - Fish	✓	✓	✓	✓	✓	✓	✓	✓	✓
Descriptors 1,4,6 – Seabed habitats Phytobenthos	✓	✓	✓	✓	✓	✓	✓	✓	✓
Descriptors 1,4,6 – Seabed habitats Zoobenthos	✓	✓	✓	✓	✓	✓	✓	✓	✓
Descriptors 1,4,6 – Water column habitats Phytoplankton	✓	✓	✓	✓	✓	✓	✓	✓	✓
Descriptors 1,4,6 – Water column habitats Zooplankton	✓	✓	✓	✓	✓	✓	✓	✓	✓
D2 – Non Indigenous Species	✓	✓	✓	✓	✓	✓	✓	✓	✓
D3 – Commercial Fish and Shellfish	✓	✓	✓	✓	✓	✓	✓	✓	✓
D5 - Eutrophication	✓	✓	✓	✓	✓	✓	✓	✓	✓
D7 - Hydrographical changes	✓	✓	✓	✓	✓	✓	✓	✓	✓
D8 - Contaminants in water	✓	✓	✓	✓	✓	✓	✓	✓	✓
D8 - Contaminants in sediments	✓	✓	✓	✓	✓	✓	✓	✓	✓
D8 - Contaminants in biota	✓	✓	✓	✓	✓	✓	✓	✓	✓
D9 - Contaminants in seafood	✓	✓	✓	✓	✓	✓	✓	✓	✓
D10 - Marine Litter	✓	✓	✓	✓	✓	✓	✓	✓	✓
D11 - Energy&Noise	✓	✓	✓	✓	✓	✓	✓	✓	✓

Experts (other than partners) / Organizations (other than partners) / Projects were contacted and all information received to achieve the projects scope is according to the following table:

	Contact person		Comments (type of information received , etc.)
HELCOM	Maria Laamanen	Professional secretary	Contact person for MORE project
HELCOM MORE project	Manuel Frias Vega	Coordinator	Sheets used for the monitoring programs overview in Baltic Sea
UNEP/MAP	Gyorgy Gurban	Ecosystem Approach Project Manager	Secretariat's Gap Analysis on ongoing Monitoring Activities - report
Black Sea Commission	Valeria Abaza	PMA officer (since 2014)	BSIMAP Review of information collected by Plan Bleu regarding Bucharest Convention, its related Protocols and Strategic Action Plan.
Black Sea Commission	Irina Makarenko	PMA officer (from 2014)	Revised BSIMAP
MISIS project	Laura Boicenco	Coordinator	Diagnostic Report II – information about monitoring programs in Black Sea
EMBLAS project	Violeta Velikova	Expert	Discussions about the inclusion of Georgia, Russia and Ukraine. Due to the specific (related to MSFD) input it was decided not to include non-EU countries, but to receive information from EMBLAS regarding monitoring programs of GE, RU and UA. Inventory files from IRIS-SES were provided to EMBLAS (Istanbul meeting, October 2014).
BALSAM	Johanna Karhu	Coordinator	Information about template for the inventory related to seabirds
Institute pf Oceanology and Fisheries, IOF, Split Croatia	Natalia Bojanic	Biologist	Information about the monitoring programmes of IOF in Croatia

2.1. THE CATALOGUE

The catalogue of the monitoring programmes consists of excel files for each country (attached 8 .xlsx files, one per country) from the two RSCs (Barcelona Convention and Bucharest Convention). Each country file consists of 17 worksheets developed to answer to Art.11 (preparation of monitoring programmes) of the MSFD requirements. Each worksheet is grouped as follows:

General information columns

RSC	*Country*	*Organization*[1]	*Sub-basin*	*Area*	*Spatial coverage*[2]	*Type of monitoring (Pressures or State)*	*Activities associated to pressures*	*Descriptor to adress*[3]	*Proposed frequency*[4]	*Frequency in 2012*

1) Responsible for monitoring

2) Terrestrial part of MS, transitional waters (WFD), coastal waters (WFD), territorial waters, EEZ, Continental shelf (beyond EEZ), Beyond MS marine waters

3) Other than the reported Descriptor, as displayed in the first table of this chapter.

4) Every 6 years, every 3 years, every 2 years, annually, biannually, quarterly, monthly, fortnightly, weekly, daily, hourly, continual, one-off, as needed, irregularly, unknown

Most of the questions arising in this part were linked to the term "proposed frequency". It was developed taking into consideration the mandatory frequencies due to different legislations or other relevant country obligations.

Parameters columns (see Annex I)

No.	Worksheet	Variables	Description
1.	Descriptors 1,4,6 - Birds	***Month(s)/Season(s)***	
		Start of data series	
		Details	
		Key species	
		Type of population[5]	breeding, wintering, moulting, etc.
		N individuals[6]	X if yes, blank if no
		N nesting pairs[7]	

No.	Worksheet	Variables	Description
		Reproductive success[8]	
		Additional variables[9]	Type/name of additional variables
2.	Descriptors 1,4,6 - Mammals	***Month(s)***	
		Species	
		Details	
		Start of data series	
		N individuals[6]	X if yes, blank if no
		N pups/calves[6]	
		Additional variables[9]	Type/name of additional variables
3.	Descriptors 1,4,6 - Fish	***Station***	
		LAT__DEC_D	
		LON__DEC_D	
		Sampling depth interval	
		Month	
		Season	
		Species/Community	
		Start of data series	
		Species level taxonomy[5]	
		Relative abundance[6]	
		Length[7]	
		Relative biomass$_8$	X if yes, blank if no
		Sex[9]	
		Age[10]	
		Maturation age[11]	
		Stomach content[12]	
		Additional variables[13]	Type/name of additional variables
4.	***Descriptors 1,4,6 – Seabed habitats Phytobenthos***	***Station***	
		LAT__DEC_D	
		LON__DEC_D	
		Month/Season	
		Start of data series	
		Species level taxonomy[5]	
		Species biomass[6]	
		Species coverage[7]	X if yes, blank if no
		Total biomass[8]	
		Total coverage[9]	
		Maximum depth distribution of	

No.	Worksheet	Variables	Description
		communities[10]	
		Substrate type[11]	
		Additional variables[12]	Type/name of additional variables
5.	***Descriptors 1,4,6 – Seabed habitats Zoobenthos***	***Station***	
		LAT__DEC_D	
		LON__DEC_D	
		Month/Season	
		Start of data series	
		Species level taxonomy[5]	
		Relative abundance[6]	X if yes, blank if no
		Relative biomass[7]	
		Size distribution of dominant species[8]	
		Additional variables[9]	Type/name of additional variables
6.	***Descriptors 1,4,6 –Water column habitats Phytoplankton***	***Station***	
		LAT__DEC_D	
		LON__DEC_D	
		Month	
		Season	
		Start of data series	
		Species level taxonomy[5]	
		Relative abundance[6]	X if yes, blank if no
		Relative biomass[7]	
		Additional variables[8]	Type/name of additional variables
7.	***Descriptors 1,4,6 –Water column habitats Zooplankton***	***Station***	
		LAT__DEC_D	
		LON__DEC_D	
		Month	
		Season	
		Start of data series	
		Species level taxonomy[5]	
		Relative abundance[6]	
		Relative biomass[7]	X if yes, blank if no
		Developmental stages[8]	
		Sex[9]	
		Additional variables[10]	Type/name of additional variables
8.	***D2 – Non Indigenous Species***	***Station***	
		LAT__DEC_D	
		LON__DEC_D	
		Month	
		Season	
		Species/ Community	
		Start of data series	
		Species level taxonomy[5]	X if yes, blank if no

No.	Worksheet	Variables	Description
		Relative abundance[6]	
		Relative biomass[7]	
		Pathway of spreading [8]	
		Additional variables[9]	
9.	***D3 – Commercial Fish and Shellfish***	***Station***	
		LAT__DEC_D	
		LON__DEC_D	
		Sampling depth interval	
		Month	
		Season	
		Species/Community	
		Start of data series	
		Species level taxonomy[5]	
		Relative abundance[6]	
		Length[7]	
		Relative biomass$_8$	
		Sex[9]	X if yes, blank if no
		Age[10]	
		Maturation age[11]	
		Stomach content[12]	
		Additional variables[13]	Type/name of additional variables
10.	***D5 - Eutrophication***	***Station***	
		LAT__DEC_D	
		LON__DEC_D	
		Bottom depth	
		Surface/water column	
		Month/Season	
		Start of data series	
		PO4_FREQ[5]	
		TP_FREQ[6]	
		DOP_FREQ[7]	
		SIO4_FREQ[8]	
		TNOx_FREQ[9]	
		NO2_FREQ[10]	
		NH4_FREQ[11]	
		TN_FREQ[12]	X if yes, blank if no
		DON_FREQ[13]	
		POC_FREQ[14]	
		DOC_FREQ[15]	
		HumicSubs_FREQ[16]	
		Chla_FREQ[17]	
		Dissolved Oxygen_FREQ[18]	
		Secchi_FREQ[19]	
		Additional[20]	Type/name of additional variables
11.	***D7 - Hydrographical changes***	***Station***	
		LAT__DEC_D	
		LON__DEC_D	
		Bottom depth	

No.	Worksheet	Variables	Description
12.	D8 - Contaminants in water	Surface/water column	
		Month/Season	
		Start of data series	
		Tem_FREQ[5]	X if yes, blank if no
		Sal_FREQ[7]	
		Curr_FREQ[9]	
		pH_FREQ[11]	
		Alkal_FREQ[13]	
		Additional[15]	Type/name of additional variables
		Station	
		LAT__DEC_D	
		LON__DEC_D	
		Bottom depth	
		Sampling depth	
		PAH[5]	X if yes, blank if no
		PCBs[6]	
		TBT[7]	
		DDT and metabolites[8]	
		HCH[9]	
		Pb[10]	
		Cd[11]	
		Hg[12]	
		Additional[13]	Type/name of additional variables
13.	D8 - Contaminants in sediments	Station	
		LAT__DEC_D	
		LON__DEC_D	
		Bottom depth	
		PAH[5]	X if yes, blank if no
		PCBs[6]	
		TBT[7]	
		DDT and metabolites[8]	
		HCH[9]	
		Pb[10]	
		Cd[11]	
		Hg[12]	
		Additional[13]	Type/name of additional variables
14.	D8 - Contaminants in biota	Station	
		LAT__DEC_D	
		LON__DEC_D	
		Bottom depth	
		Species	
		Organ	X if yes, blank if no
		PAH[5]	
		PCBs[6]	
		TBT[7]	
		DDT and metabolites[8]	

No.	Worksheet	Variables	Description
		HCH[9]	
		Pb[10]	
		Cd[11]	
		Hg[12]	
		Effects[13]	
		Additional[14]	Type/name of additional variables
15.	*D9 - Contaminants in seafood*	***Station***	
		LAT__DEC_D	
		LON__DEC_D	
		Bottom depth	
		Species	
		Organ	
		PAH[5]	
		PCBs[6]	
		TBT[7]	
		DDT and metabolites[8]	
		HCH[9]	X if yes, blank if no
		Pb[10]	
		Cd[11]	
		Hg[12]	
		Legislation[1]	
		Additional[14]	Type/name of additional variables
16.	*D10 - Marine Litter*	***Amount of beach litter[5]***	
		Amount of litter in the water[6]	
		Amount of litter in the sea bottom[7]	X if yes, blank if no
		Distribution of litter[8]	
		Litter ingested by marine animals[9]	
		Additional[10]	Type/name of additional variables
17.	*D11 - Energy&Noise*	***Type of activity[5]***	
		No. of days[6]	X if yes, blank if no
		Duration: short or long lasting[7]	
		Additional[8]	Type/name of additional variables

Common information about data:

Method[15]	*QA*[16]	*Platform/ Resource*[17]	*Sharing resources for JMPs*[18]	*Links to other monitoring programmes*[19]	*Data policy*[20]	*Reported to*[21]	*Web links*[22]	*Comment*[23]
15) Method of collection, survey, sensors, etc.								
16) QA=Quality Assurance as BEQUALM, COMBINE, ICES, IODE-IOC, JGOFSL1, QUASIMEME, regional standard, national standard, other, unknown								
17) Ship, sensors, remote sensing, etc.								
18) Yes/No, If YES what resource and spatial coverage								
19) Bathing Water Directive, Common Fisheries Policy-Data Collection framework, Habitats Directive, Birds Directive, Nitrates Directive, UUTW Directive, WFD, Shellfish Directive, Barcelona Convention, Bucharest Convention, Other (specify)								
20) Availability of data								
21) EIONET, RSC, etc.								
22) Links to web pages with relevant information								
23) Nature of data (raw, processed, products, models) any other relevant comments for the purpose of the MSFD needs								

The catalogue provides a detailed list of monitoring programmes undertaken by several Member States (Croatia, Cyprus, Greece, Italy, Spain, Bulgaria, and Romania) and one candidate state (Turkey) in the Mediterranean Sea and the Black Sea, related to all descriptors of the MSFD. The catalogue considers all the information relevant to the MSFD Art.11 reporting. Data from France were not included as the country's authorities never replied to the request of the project and the coordinator

2.2. INITIAL DESIGN OF THE DATABASE

The aim here was to create a metadata base with information from national/international monitoring programmes, and different EU projects (PERSEUS, MISIS, ODEMM, DEVOTES etc.). Through the information collected in the metadata base, the IRIS-SES project aims to identify regions/sub-regions where countries can collaborate and/or create integrated monitoring programmes. Additionally, with the aid of the metadata base, each country's monitoring programmes having different needs could be combined into one, in order to achieve integration and better resource efficiency.

The metadata base was planned to be compatible with the larger oceanographic/environmental databases like SeaDataNet and EMODNET, through the use of INSPIRE and SeaDataNet standards. This way related information can be imported from the mentioned databases, and provide a better opportunity for increased resource efficiency.

During the creation of the metadata base, the WG DIKE recommendations for the implementations of the monitoring under MSFD are used as a guide, as well for the formation of the Inventories. However, these recommendations focus mainly on data rather than metadata (Table 2.1). Therefore, the metadata database includes more information than the DIKE recommendation, while it summarizes the Inventory sheets discussed in the Catalogue section above.

Table 2.1: METADATA as defined in WG DIKE Monitoring under MSFD recommendations for Implementation Report (May, 2013)[1].

	Directive	Directive text	Questions for reporting	Art. 12 criterion
About		[METADATA]	**Question 4** Metadata about each programme: • Programme name, reference code • Description • Year started (or due to start); year ended (if appropriate) • Geographical coverage via a GIS polygon or grid (as per reporting on assessment areas for Art. 8) and by reference to the four zones in Table 1 of the "concept paper" • Which organization within the MS is responsible for the establishment and the implementation of the programme in that country	

The Metadata base can be utilized in several ways, filtering the dataset/programmes under different regions or parameters, as well as according to the descriptors or EC Directives which it serves. To be able to determine the transboundaries or possible common implementations, the bounding boxes will serve as the initial intersection of programmes.

Once identified that/if the programmes carry common monitoring locations, then the project will proceed to other monitoring requirements, which can be matched/modified, so that an integrated monitoring programme between several member states can be implemented.

[1] Marine Strategy Framework Directive (MSFD) Common Implementation Strategy, Working Group on Data, Information and Knowledge Exchange (WG DIKE). DIKE DG/2013/02.

2.3. INITIAL METADATA BASE

The metadata base content columns and their description /explanation are reported in details below:

Database Column	Description	Relation to standards
Identifier	Unique identifier for the record	INSPIRE
Region / Sub-region / Sea	Region, sub-region or sea where the metadata is identified	INSPIRE
Country	Country of origin	INSPIRE (member state)
Responsible Organization	Responsible organization holding the datasets	INSPIRE
RSC	Regional Sea Convention	Additional
Related Descriptor(s)	Descriptors related to the dataset	Additional
Related Directive(s)	EC Directives related to the dataset in the end that will serve towards which directives	Additional
Parameter Groups	Parameters monitored in the dataset	Additional
Start Date	Start date of the monitoring programme	INSPIRE/SDN (Temporal Extent)
End Date	End date of the monitoring programme	INSPIRE/SDN (Temporal Extent)
Frequency	Frequency of the monitoring	Additional
Westbound Longitude	West boundary of the bounding box	INSPIRE (Bounding box)
Eastbound Longitude	East boundary of the bounding box	INSPIRE (Bounding box)
Southbound Latitude	South boundary of the bounding box	INSPIRE (Bounding box)
Northbound Latitude	North boundary of the bounding box	INSPIRE (Bounding box)
Spatial Coverage	The spatial domain covered with the datasets providing information for WFD or MSFD related regions	Additional
Programme Status	Continuity of the programme	
Topic Category (INSPIRE Theme)	INSPIRE Theme of the dataset	INSPIRE
Monitoring Activity Rationale	Why the monitoring is conducted	SDN

Database Column	Description	Relation to standards
Pressures Associated	Associated pressures that can be determined through the dataset	Additional
Data Access Policy	Policy to access to the datasets	SDN

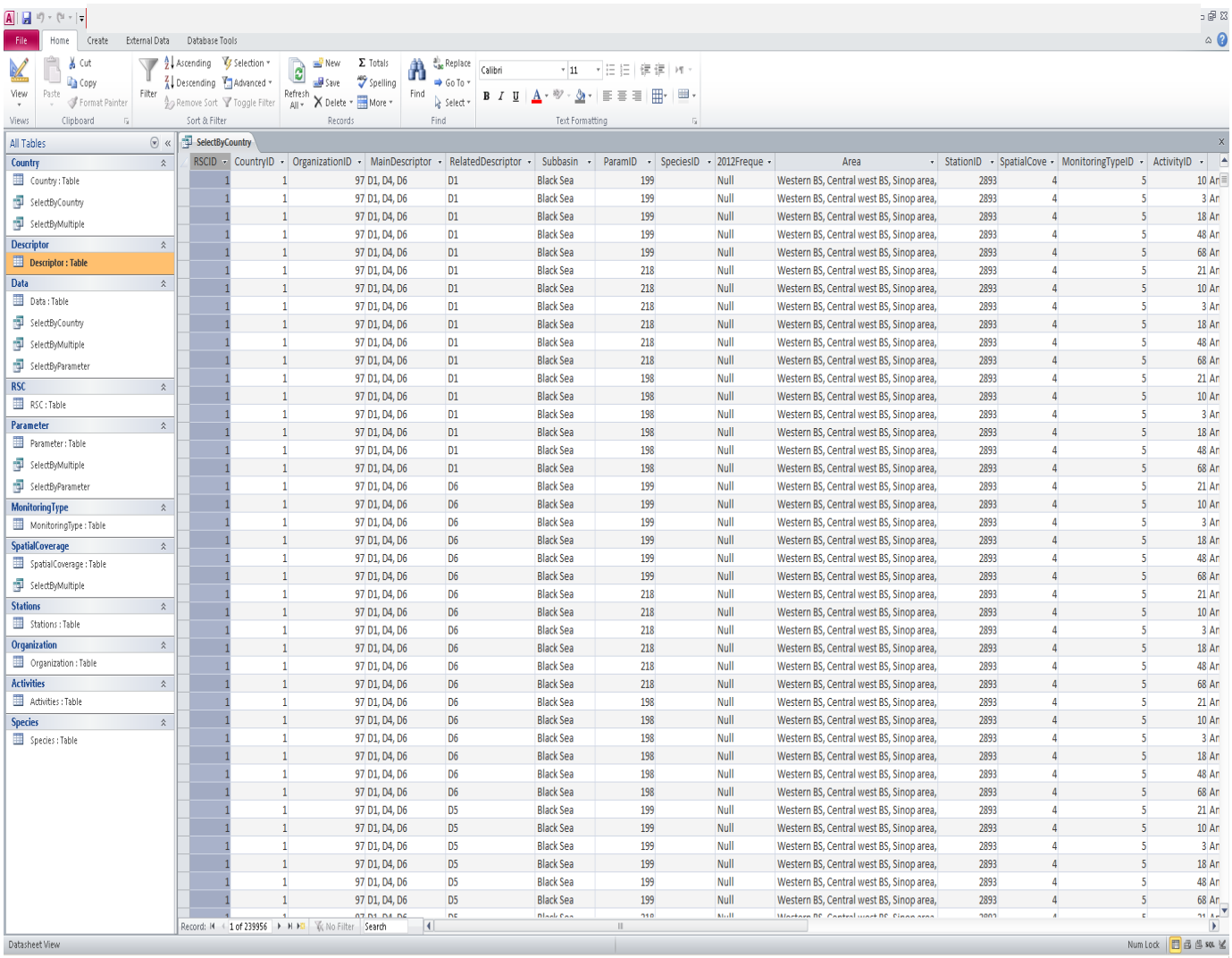
2.4. FINAL VERSION OF THE METADATABASE

The final version of the metadata base has now an "Access" format (http://iris-ses.eu/final-metadatabase-for-iris-ses/). Each possible category of data column in the catalogue (with related information) is now an independent database table. There are 10 tables used for common information obtained from the inventory sheets: Activities, Country, Descriptor, Monitoring Type, Organization, Parameter, RSC, Spatial Coverage, Species, Stations, while many similar parameters with different names where unified and fixed (e.g. unified/fixed all shipping, shipping activity - > to Shipping Activity). "Data" table is a combination of each of these tables represented by the row ID of each selection from their own table. The relation between information tables and the Data table is organized by special ID's. Each information table holds the information only one time, and is associated with a single ID in its own table. Then in the Data table only the ID of this specific field is used to identify the information.

In addition, except several columns, all the possible columns with multiple values are separated as single values (for example parameter column, containing 5 parameters in one row in Excel, is represented as 5 rows with single parameter in each row). Hence, the number of data rows in the database rose to almost 400000.

This way querying the database becomes easier and much more efficient. Few sample queries were also included and that would operate on the database to return different parameters and columns, and by also applying a filter on the database (e.g. selecting the rows with specified country).

The structure of the metadata base is more like a professional database than meta-database. Each common parameter between different descriptors and different countries is used to construct a different table in database.


File
Home
Create
External Data
Database Tools
All Tables
Country
Country : Table
SelectByCountry
SelectByMultiple
Descriptor
Descriptor : Table
Data
Data : Table
SelectByCountry
SelectByMultiple
SelectByParameter
RSC
RSC : Table
Parameter
Parameter : Table
SelectByMultiple
SelectByParameter
MonitoringType
MonitoringType : Table
SpatialCoverage
SpatialCoverage : Table
SelectByMultiple
Stations
Stations : Table
Organization
Organization : Table
Activities
Activities : Table
Species
Species : Table
SelectByCountry
RSCID
CountryID
OrganizationID
MainDescriptor
RelatedDescriptor
Subbasin
ParamID
SpeciesID
2012Freque
Area
StationID
SpatialCove
MonitoringTypeID
ActivityID
Western BS, Central west BS, Sinop area,
Black Sea
97 D1, D4, D6
Null
Datasheet View

3. ANALYSIS OF PRESSURES

The analysis of pressures was scheduled in IRIS-SES under Activity 1 – Task 2 (Task 1.2). In the view of designing joint monitoring programmes (JMP) under the framework of the MSFD, the present task aims to develop a review of the available data on pressures exerted on the marine and the coastal ecosystems of the Mediterranean and Black Seas. Furthermore, it intends to provide an analysis of the main human activities (including those under license requirements), which affect the marine and coastal environments, by reference to the needs for an integrated monitoring of pressures.

3.1. INVENTORY AND CRITICAL ASSESSMENT OF THE REGIONAL AND INTERNATIONAL LEGISLATIONS REGULATING THE MARINE ENVIRONMENT MONITORING IN THE SOUTH EUROPEAN SEAS

3.1.1 INTRODUCTION

The analysis of environmental pressures in the context of the IRIS-SES Project

The EC Pilot Project IRIS-SES (Integrated Regional monitoring Implementation Strategy in the South European Seas) aims to build a new approach and develop decision making tools for an integrated marine monitoring as required by the Marine Strategic Framework Directive (MSFD, 2008/56/EC), in order to support an effective management of anthropogenic activities in the marine waters of the Mediterranean and Black Seas.

IRIS –SES intends to reach the above target through five structured objectives:

- Development of integrated monitoring strategies built on the running monitoring programmes;
- Development of multidisciplinary monitoring guidelines and integrated ecosystem surveys;
- Development of strategic approaches to monitor anthropogenic pressures;

- Development of integrated monitoring tools and programmes at sea regions scales;
- Planning for joint monitoring programmes (JMPs) in pilot regions of the under study regional seas, based whenever possible on existing monitoring programmes, looking for their optimization, in order to improve their adequacy to MSFD sampling requirements.

These objectives have been achieved through a 20month work plan structured into activities and tasks.

The main aim of the Activity 1 (Analysis of the monitoring programmes carried on the framework of European/regional/national legislation in relation to MSFD requirements) is the preparation of a catalogue and a comprehensive analysis of the existing monitoring programs related to European directives and other international and regional conventions in the Mediterranean and Black Seas, in order to assess the contribution of these programs to meeting the MSFD needs.

In view of the design of JMP in the framework of the MSFD, Task 2 of Activity 1 aims at developing a review of data availability on pressures exerted on the marine and coastal ecosystems of the Mediterranean and Black seas. Furthermore, it intends to provide an analysis on the main human activities that take place directly in (or in close vicinity of) marine and coastal environments, by reference to the needs for an integrated monitoring of pressures.

Several subtasks have been defined to undertake the analysis:

a) Undertake an inventory and critical assessment of the legislation regulating the marine environment monitoring of the Mediterranean and Black Seas, with a focus on supra national legal instruments (EU Directives and Regulations, Regional Sea Conventions and their Protocols, other Regional and International Conventions).

b) Gather and assess data on human activities and associated pressures and impacts in the marine environment.

c) Assess future trends of the human activities leading to future environmental pressures.

d) Consider the need for monitoring data (i.e. address data gaps) to support future assessments and managerial actions.

The outputs of these subtasks are presented in two deliverables and in two associated Excel databases (http://iris-ses.eu/activity-1-outcomes-of-the-cataloguing-of-current-monitoring-programmes-and-analysis-of-pressures/). The results of subtask a) are displayed in this deliverable, referenced as number 4 and 5 under Activity 1 in the project "Description of the Action", and in the associated MS Excel database "1.2_IRIS _SES_PlanBleu_Analysis_Pressures_a".

The results of subtasks b), c) and d) are presented in a second deliverable entitled "Trend analysis of key pressures for the design of joint monitoring programmes under the MSFD" and correspond to number 6 as referenced in the project "Description of the Action". Its associated Excel document is "1.2_IRIS_SES_PlanBleu_AnalysisPressures_bcd".

Monitoring provisions under the Marine Strategy Framework Directive

The integrative approach of the Marine Strategy Framework Directive (MSFD) represents an ambitious step towards establishing a more effective management of the European marine environments. The MSFD requires EU Member States (EU MS) to take the necessary steps to achieve or maintain Good Environmental Status (GES) by 2020. Its implementation is currently underway and the first requirements have been fulfilled: EU MS have prepared Initial Assessments (IAs) regarding the status of their marine environments; defined GES along with related criteria and methodological standards; and established a series of environmental targets and indicators (MSFD, art. 8, 9 and 10).

Next stages of the MSFD implementation involve the definition and implementation of monitoring programmes, as established in art. 11 of the Directive, for the ongoing assessment of the environmental status of the EU countries' marine waters, by reference to the environmental targets set. According to the schedule stipulated, EU MS were due to provide their monitoring programmes by mid-2014.

The concept of monitoring is defined in the frame of the MSFD as "the systematic measurement of biotic and abiotic parameters with pre-established temporal and spatial schedule, in order to produce the datasets for the application of the assessment methods

and derive safe conclusions whether Good Environmental Status is achieved or not in the marine area". In this sense, monitoring activities are meant to mainly focus on the collection of suitable data allowing the application of assessment methods and providing feedback on progress towards achieving GES. Defining monitoring activities includes the selection of the parameters to be measured, their processing and measurement, the sampling periodicity and sampling sites (Zampoukas *et al*., 2012).

Scope and objectives

The MSFD specifically states that monitoring programmes "shall build upon, and be compatible with, relevant provisions for assessment and monitoring laid down by Community legislation, including the Habitats and Birds Directives, or under international agreements".

In view of the several national and European monitoring programmes that might run in parallel resulting from the application of different regulation bodies (international or regional), it has been necessary to conduct a thorough revision of all monitoring activities being either carried out or, at least, legally required in the project's study area (i.e. the European Southern Seas, SES), with a special focus on gaps and duplications. The overall objective is to identify potentially existing monitoring activities put in place by countries considered in the IRIS-SES Project (i.e. Bulgaria, Croatia, Cyprus, France, Greece, Italy, Malta, Romania, Slovenia, Spain and Turkey) to provide support to the development of integrated JMPs, so that these will effectively cover all MSFD descriptors and allow the characterisation of the environmental status of the marine environments in both the Mediterranean and Black Seas.

To this purpose, the present deliverable provides an inventory and critical assessment of the legislation requiring the setting and implementation of marine monitoring programmes in the Mediterranean and Black Seas. The assessment focuses on international, regional and European legal instruments, i.e. EU directives and regulations, Regional Sea Conventions and related documents, and other regional and international conventions and agreements. Given the binding nature of supranational legislation, it can be expected that the requirements reviewed in the present deliverable have been transposed into domestic

regulations. This is at least mandatory for EU directives, which have to be transposed into national laws. However, the assessment of legal requirements at the country level is recommended for the actual design of monitoring programmes under the MSFD, which have to be established and implemented by Member States (EU MS), according to Article 11.

It is expected that GES will be primarily achieved through the reduction and mitigation of pressures and impacts on the marine environment. In this sense, the programmes of measures that are to be set up in the next stages of the MSFD implementation are believed to focus on environmental pressures and impacts, as well as on their origins. Consequently, this deliverable intends to concentrate, in the extent possible, on the legal requirements and/or regulatory recommendations concerning specifically the monitoring of pressures exerted by human activities in the SES.

3.1.2 METHODS

The assessment contains three main sections related to: existing Regional Sea Conventions and related regulatory documents; existing European directives and derived regulations; and, finally, international and regional conventions applying to the area of interest.

The analysis and data collection regarding the legislation bodies has been carried out as shown in Table 3.1 and Table 3.. The first columns (Table 3.) refer to general information describing each regulatory text, including its name and its scope of application (e.g. Contracting Parties (CPs) to the Barcelona Convention, CPs to the Bucharest Convention, European, regional or international), as well as its status (signature, ratification, entry into force) with an exclusive focus on the countries considered under the IRIS-SES Project (EU Mediterranean and Black Sea countries, and Turkey).

Table 3.1: Inventory and critical assessment of international and regional regulations (I)

A	B	C	D	E	F	G	H	I	J
Legislation name		**Scope of application**	**Status**		**Monitoring reference**	**If Y, Article ref.**	**Extract of article**	**Provision for reporting or related procedures**	
Acronym	Full name	Text	Status	Countries*	Y / N	Text	Text	Y / N	Ref. Articles/ Key words

Table 3.2: Inventory and critical assessment of international and regional regulations (II)

K	L	M	N	O	P	Q
If Y, Organism in charge of reporting / Repository for reporting		**Critical assessment of reporting (effective or not)**	**Type of Monitoring (Pressure, State or Impact)**	**Associated MSFD descriptors**	**Associated EcAp EOs**	**Activities associated to pressures (1)**
Text, URL	Other developed legislation	Text	Key words	Key words	Key words	Text

Subsequent columns K-N (Table 3.) provide details on the monitoring programmes as envisaged in the reviewed regulatory texts: information and extracts regarding references to monitoring or to the establishment of monitoring programmes are reported in the texts. In addition, provisions for monitoring reporting and organisms in charge of compiling monitoring reports (when existing) are also indicated. Finally, columns O-T are associated to the MSFD descriptors – and to the Mediterranean Action Plan's EcAp's Ecological Objectives when appropriate - that are related with the object of the regulations. Human activities which may be exerting pressures on marine ecosystem components object of the regulatory bodies are also listed, according to Annex 4 of the Commission Staff Working Paper[2].

The complete assessment and associated information has been collected and stored into a MS Excel database entitled "1.2_IRIS _SES_PlanBleu_Analysis_Pressures_a", containing two MS Excel sheets named "Regional Convention-Legislation" and "International Conventions". The former collects information related to the assessment of regional sea conventions and EU legislation, while the latter comprises the assessment regarding international conventions and agreements.

[2] Commission Staff Working Paper, Relationship between the Initial Assessment of Marine Waters and the Criteria for GES, 2011.

3.1.3 RESULTS

General considerations

In all, fifty-four legislation instruments have been reviewed, considering convention texts, protocols, guidelines and EU Directives (Table 3.3), the findings and conclusions of their review are detailed in the following sections and tables.

Table 3.3: List of regulations surveyed and checked for monitoring requirements in the Mediterranean and Black Seas

Regional Sea Conventions	• The Barcelona Convention, its 7 complementary Protocols, and related Guideline documents. • The Bucharest Convention, its 4 complementary Protocols and its Strategic Action Plan.
European Directives	• Water Framework Directive and subsequent amendments (Decision 2455/2001/EC, Directive 2008/32/EC) • Environmental Quality Standards Directive • EIA Directive • Habitats Directive • Birds Directive • Bathing Waters Directive • Urban Waste Water Directive • Nitrates Directive • Common Fisheries Policy: Council Regulation Nº199/2008 and Commission Decision 2003/93/EU • Invasive Alien Species Directive Proposal • ICZM and MSP Directive Proposal
International Conventions	• The Convention on Biological Diversity and complementary Protocols (Cartagena and Nagoya Protocols) • United Nations Convention on the Law of the Sea • United Nations Fish Stocks Agreement • London Convention and Protocol on Marine Pollution and Dumping on Wastes and Other Matter

Other relevant Conventions	• International Convention for the Control and Management of Ships' Ballast Water and Sediments • MARPOL Convention • Bonn Convention • International Convention on the Control of Harmful Antifouling Systems on Ships • European Landscape Convention • ACCOBAMS Agreement

Regional Activity Centres (RACs) and other bodies related to the Mediterranean Action Plan (such as REMPEC, RAC-SPA and MEDPOL) have been consulted, in order to obtain further clarification on their respective roles and responsibilities in the context of the Barcelona Convention, as they are in charge of the implementation of several of its Protocols. Regarding the Bucharest Convention, the Black Sea Commission was contacted for the same purpose.

Several difficulties have been encountered while carrying out the assessment of the legislation texts. First, legal requirements may contain different terms (occasionally ambiguous) referring to monitoring activities, i.e. “At-sea monitoring”, “Survey”, “Surveillance”, “Research survey”, “Collection, management and use of data”, “Official surveillance system”, “Inventories of resources and activities”, “Inspection” or “Incident reporting”. Such terms were considered carefully and were seen in context, in order to understand their exact meaning and whether they matched the monitoring requirements as set up in the frame of the MSFD.

As pointed out earlier, the objective of the present assessment is to highlight legal requirements for marine monitoring focusing on environmental pressures and, thus, on the associated drivers and human activities. However, the type of monitoring by reference to the DPSIR approach (whether it refers to pressures, states or impacts) remains frequently undefined in the reviewed legal texts, thus leaving it open to a broad interpretation. In practice, all monitoring dispositions that could include pressure monitoring have been considered.

Regional Sea Conventions

Legislative texts of both the Barcelona Convention and the Bucharest Convention, along with their related Protocols and pertinent Guidelines, have been reviewed, in order to highlight monitoring obligations regarding marine ecosystems in the Mediterranean and Black Seas.

The Barcelona Convention, complementary Protocols and related Guideline documents

The analysis has focused on the text of the Barcelona Convention along with its seven complementary Protocols:

- Dumping Protocol: Protocol for the Prevention of Pollution in the Mediterranean Sea by Dumping from Ships and Aircraft.
- Emergency Protocol: Protocol Concerning Cooperation in Preventing Pollution from Ships and, in Cases of Emergency, Combating Pollution in the Mediterranean Sea.
- LBS Protocol: Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources and Activities.
- SPA/ BD Protocol: Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean.
- Offshore Protocol: Protocol for the Protection of the Mediterranean Sea against Pollution from Exploration and Exploitation of the Continental Shelf and the Seabed and its Subsoil.
- Hazardous Wastes Protocol: Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal.
- ICZM Protocol: Protocol on Integrated Coastal Zone Management in the Mediterranean.

A sample of the information collected for each legislation body can be found in Table 3.4 concerning the Barcelona Convention, which synthesizes its legal status and ratification by the IRIS-SES countries, along with monitoring obligations and relationships with MSFD Descriptors, as well as obligation(s) for reporting. In addition, main human activities linked to the object of the legal text (and to pressures on marine and coastal environments) are also

detailed.

Table 3.4 summarizes compiled information for the 7 complementary Protocols to the Barcelona Convention.

Table 3.4: Review of the text of the Barcelona Convention: legal status, monitoring provisions and links with MSFD

Barcelona Convention		
Status	Signed 1976 - amended 1995 In force in February 1978 and July 2004	
IRIS SES countries	Ratified by all IRIS-SES Mediterranean countries	
Legal reference to monitoring	Article 12: "1. *The CPs shall endeavour to establish, in close cooperation with the international bodies which they consider competent,* ***complementary or joint programmes*** *(…) for* ***pollution monitoring in the Mediterranean Sea Area*** *(…)".*	
Type of Monitoring (Pressures / States)	Pressure / State: "Pollution monitoring in the Mediterranean Sea Area"	
Monitoring / MFSD Descriptors	5, 8, 9	
Activities associated to pressures	Food Production	Aquaculture.
	Extraction of non-living resources	Marine mining; dredging; desalination/water abstraction.
	Transport	Shipping.
	Military	Dumping of unwanted munitions.
	Land-based activities/industries	Coastal, riverine and atmospheric inputs from land - industrial discharges and emissions; coastal, riverine and atmospheric inputs from land - agricultural and forestry run-off and emissions; coastal, riverine and atmospheric inputs from land - municipal waste water discharge.
	Waste disposal	Solid waste disposal included dredged material; storage of gasses.
Derived legislation	Decision IG 17/3 Reporting Format for the Implementation of the Barcelona Convention and its Protocols Decision IG. 19/4 Testing MAP Effectiveness Indicators	
Reporting obligations	Yes, general.	

Table 3. 5: Synthesis of the Barcelona Convention and related Protocols: legal status, monitoring provisions and links with the MSFD

	Dumping Protocol	Emergency Protocol	LBS Protocol	SPA/ BD Protocol	Offshore Protocol	Hazardous Wastes Protocol	ICZM Protocol
Legal Status	Signed 1976 / In force in 1978 Amended as Protocol for the Prevention and Elimination of Pollution in the Mediterranean Sea by Dumping from Ships and Aircraft or Incineration at Sea / not in force	Original Emergency Protocol from 1976, replaced in 2002; in force in 2004.	Original LBS Protocol from 1980 / In force in 1983; Amended in 1996; In force in 2008.	Original SPA Protocol (1982) replaced by SPA / BD Protocol signed in 1995; In force in 1999.	Signed in 1994; In force in 2011.	Signed in 1996; In force in 2008.	Signed 2008; In force in 2011;
IRIS-SES countries*	Amendments accepted by all countries except for Greece.	Ratified by all	Ratified by all	Ratified by all except for Greece	Signed by all, except for Turkey. Ratified/ in force: Cyprus	Signed by Greece, Italy, Malta, Spain & Turkey. Pending: Croatia, Cyprus, France & Slovenia. Ratified (in force) by Malta & Turkey.	Signed by all except for Cyprus & Turkey; Ratified/ in force: Croatia, France, Slovenia & Spain
Reference to monitoring	No (incident reporting)	Yes	Yes	Yes	Yes	No	Yes
Type of Monitoring	Not applicable	Pressure / state	Pressure / state	Pressure / state	Pressure / state	Not Applicable	Pressure / state
Monitoring / MFSD Descript.	- -	5, 8, 9	5, 8, 9	1-11 (all)	5, 8, 9	- -	1-11 (all)
Derived legislation	- Guidelines for Dumping of Inert, Uncontamin. Geological Materials, 2005. - Guidelines on env. inspection systems for the Med. region, 2004. - Guidelines for Dumping of Platforms & other Man-made Struct. at Sea, 2003. - Guidelines for the Management of Dredged Material, 1999.	- Decision IG.20/11 on Med. Strategy on Ships' Ballast Water Management, 2012; - Decision IG.17/10 Regional Strategy for Prevention of & Response to Marine Pollution from Ships, 2005.	Decision IG.20/10 Strategic Framework for Marine Litter Management.	Annexes adopted in 1996, amended in 2009, in force in 2011.	Decision IG 20/12 Protection against Pollution from Exploration & Exploitation of the Continental Shelf and the Seabed and its Subsoil Decision IG 21/8. Offshore Protocol		

	- Guidelines for Monitoring Marine Dumping Sites, 1991.	- Guidelines for Cooperation in Combating Oil Pollution, 1987.			Action Plan.		
	Decision IG 17/3 Reporting Format for the Implementation of the Barcelona Convention and its Protocols Decision IG. 19/4 Testing MAP Effectiveness Indicators						
Reporting obligations	Incident reporting on a voluntary basis to other CPs (text of the Protocol); Reporting obligations in all Guidelines, specifically set for monitoring requisites.	Yes, general. Reporting obligations specifically set for monitoring in Guidelines.	Yes, specifically set for monitoring.	Yes, specifically set for monitoring.	Yes, general.	--	Yes, general.

***Mediterranean countries, only**

The Bucharest Convention, complementary Protocols and Strategic Action Plan

Regarding the Bucharest Convention on the Protection of Black Sea against Pollution, the analysis has focused on the text of the Convention, its four complementary Protocols and Action Plan:

- LBS Protocol: Protocol on Protection of the Black Sea Marine Environment Against Pollution from Land Based Sources;
- Dumping Protocol: Protocol on the Protection of the Black Sea Marine Environment Against Pollution by Dumping;
- Emergency Protocol: Protocol on Cooperation in Combating Pollution of the Black Sea Marine Environment by Oil and Other Harmful Substances in Emergency Situations;
- Biodiversity and Landscape Protocol: The Black Sea Biodiversity and Landscape Conservation Protocol to the Convention on the Protection of the Black Sea Against Pollution;
- SAP (2009): Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea.

An example of the information collected is presented in Table 3.6 concerning the text of the Bucharest Convention. Legal status, ratification by the IRIS-SES countries, monitoring obligations and relationships with MSFD Descriptors are synthesized; extracts of articles referring specifically to obligation(s) for developing monitoring activities and for reporting are included. In addition, main human activities that may be linked to the object of the regulation (and to pressures on marine and coastal environments) are also detailed.

Table 3.6: Review of the text of the Bucharest Convention: legal status, monitoring provisions and links with MSFD

Convention on the Protection of Black Sea Against Pollution		
Status	Signed 1992 / In force between January and March 1994	
IRIS SES countries	Ratified by all IRIS-SES Black Sea countries	
Legal reference to monitoring	Article 15: Scientific and technical cooperation and monitoring "*3. The CPs shall, inter alia, establish through the Commission and, where appropriate, in cooperation with international organizations they consider to be competent,* ***complementary or joint monitoring programmes covering all sources of pollution and shall establish a pollution monitoring system for the Black Sea*** *including, as appropriate, programmes as bilateral or multilateral level for observing, measuring, evaluating and analysing* ***the risks or effects of pollution of the marine environment of the Black Sea***".	
Type of Monitoring (Pressures / States)	Pressure / State: "*…covering all sources of pollution* (pressures) (...) *evaluating and analysing effects of pollution in the marine environment* (state)".	
Monitoring/ MFSD Descriptors	5, 8, 9, 10, 11	
Activities associated to pressures	Extraction of living resources	Fisheries including recreational fisheries, seaweed and other sea-based food harvesting; extraction of genetic resources/ bio prospecting/maerl.
	Food Production	Aquaculture.
	Man-made structures (incl. construction phase)	Coastal defence, land claim, port operations, placement & operations of offshore structure (other than energy), submarine cables and pipelines.
	Extraction of non-living resources	Marine mining; dredging; desalination/water abstraction.
	Energy production	Marine-based renewable energy generation; marine hydrocarbon extraction.
	Transport	Shipping.
	Military	Dumping of unwanted munitions.
	Land-based activities/industries	Coastal, riverine and atmospheric inputs from land - industrial discharges and emissions; coastal, riverine and atmospheric inputs from land - agricultural and forestry run-off and emissions; coastal, riverine and atmospheric inputs from land - municipal waste water discharge.
	Waste disposal	Solid waste disposal included dredged material; storage of gasses.
	Tourism and recreation	Tourism and recreation including yachting.
	Research and survey	Marine research, survey and educational activities.
Reporting obligations	No.	

Table 3.7 summarizes the information gathered for the main legal texts related to the Bucharest Convention, i.e. the Convention, related Protocols and Strategic Action Plan.

Table 3.7: Synthesis of the Bucharest Convention and related Protocols and SAP: legal status, monitoring provisions and links with the MSFD

	Bucharest Convention	LBS Protocol	LBSA Protocol	Emergency Protocol	Dumping Protocol	Biodiversity and Landscape Conservation Protocol	Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea
Status	Signed 1992; In force in 1994.	Signed in 1992; In force in Jan 1994	Amending LBS Protocol (1992) Signed in 2009. Not in force.	Signed in 1992; In force in Jan 1994	Signed in 1992; In force in Jan 1994	Signed in 2002; In force in June 2011	Signed in 2009 (replaced SAP of 1996). In force in April 2009
IRIS SES countries*	Ratified by all	Ratified by all	Signed by all	Ratified by all	Ratified by all	Signed by: Bulgaria, Romania and Turkey; Ratified by: Bulgaria, Turkey	Ratified by all
Legal reference to monitoring	Yes	Yes	Yes	No	No	Yes	Yes
Type of Monitoring (Pressures / States)	Pressure / state	Pressure / state	Pressure / state	Not Applicable	Not Applicable	State	Pressure / state
Monitoring MFSD Descriptors	5, 8, 9, 10, 11	5, 8, 9, 10	5, 8, 9, 10,11	--	--	1, 2, 3, 4, 6, 7	1-11 (all)
Reporting obligations	No.	Yes, general.	Yes, specifically set for monitoring.	--	--	Yes, general.	Yes, specifically set for monitoring.

***Only Black Sea countries**

European Directives

Sixteen European legislative texts (directives, regulations, decisions and directive proposals) having directly or indirectly an effect on the marine and/or coastal environments have been reviewed to examine their provisions regarding monitoring. These are:

- **Directive 2008/56/EC** of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive); the MSFD has been taken as a reference.
- **Directive 2011/92/EU** of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (codification);
- **Directive 2009/147/EC** of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (Birds Directive);
- **Directive 2008/32/EC** of the European Parliament and of the Council of 11 March 2008 Establishing a Framework for Community Action in the Field of Water Policy, as Regards the Implementing Powers Conferred on the Commission;
- **Directive 2008/105/EC** of the European Parliament and of the Council of 16 December 2008 on Environmental Quality Standards in the field of Water Policy (EQS Directive);
- **Directive 2006/7/EC** of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC;
- **Directive 2000/60/EC** of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (Water Framework Directive - WFD);
- **Decision 2455/2001/EC** of the European Parliament and of the Council of 20 November 2001 Establishing the List of Priority Substances in the Field of Water Policy and Amending Directive 2000/60/EC;
- **Council Directive 92/43/EEC** of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive);
- **Council Directive 91/271/EEC** of 21 May 1991 concerning urban waste water treatment;

- **Council Directive 91/676/EEC** of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources;
- **Commission Decision 2010/93/EU** of 18 December 2009 adopting a multiannual Community programme for the collection, management and use of data in the fisheries sector for the period 2011-2013;
- **Council Regulation (EC) No 199/2008** of 25 February 2008 concerning the establishment of a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy;
- **Commission Regulation (EC) No 1881/2006** of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs;
- Proposal for a Regulation of the European Parliament and of the Council on the prevention and management of the introduction and spread of invasive alien species;
- ICZM and MSP Directive Proposal.

Table 3. 8 and Table 3. 9 synthesize the analysis conducted for each legislative text. They provide an overview of the European legal bodies already containing monitoring provisions regarding the marine environment; as well as an indication on the MSFD Descriptors that might be already addressed by implemented monitoring programmes, at least in EU MS, due to the binding nature of EU legislation on MS.

Table 3. 8: Synthesis of the European legislation: legal status, monitoring provisions and links with the MSFD

	MSFD (reference)	WFD	Decision 2455/2001/EC	Directive 2008/32/EC	EQS Directive	Habitats Directive	Birds Directive	Bathing Waters Directive
Status	Approved in 2008	Approved in 2000	Approved in 2001	Approved in 2008	Approved in 2009	Approved in 1992	Approved in 2009	Approved in 2006
IRIS SES countries*	Ratified by EU MS	Ratified by EU MS	Ratified by EU MS	Ratified by EU MS	Ratified by EU MS	Ratified by EU MS	Ratified by EU MS	Ratified by EU MS
Legal reference to monitoring	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Type of Monitoring (Pressures / States)	Pressure / state	State	Pressure / state	State	State	State	Not Applicable	State
Monitoring MFSD Descriptors	1- 11 (all)	1, 2, 3, 4, 5, 7, 8, 9	1, 2, 3, 4, 5, 7, 8, 9	1, 2, 3, 4, 5, 7, 8, 9	5, 8, 9	1, 3, 4, 6 (directly) All (indirectly)	- -	5, 8
Derived legislation		Decision 2455/2001/EC Directive 2008/32/EC						
Reporting obligations	Yes, specifically set for monitoring	Yes, specifically set for monitoring	Yes, specifically set for monitoring	Yes, specifically set for monitoring	Yes, specifically set for monitoring	Yes, specifically set for monitoring	- -	Yes, specifically set for monitoring

Table 3. 9: Synthesis of the European legislation: legal status, monitoring provisions and links with the MSFD

	Urban Waste Water Directive	Nitrates Directive	Council Reg. (EC) No 199/2008	Comm. Decision 2010/93/EU	Comm. Regulation (EC) 1881/2006	EIA Directive	Invasive Alien Sp. Directive Proposal	ICZM and MSP Directive Proposal
Status	Approved in 1991	Approved in 1991	Approved in 2008	Approved in 2010	Approved in 2006	Approved in 2011	Not approved	Not approved
IRIS SES countries*	Ratified by EU MS	Ratified by EU MS	Ratified by EU MS	Ratified by EU MS	Ratified by EU MS	Ratified by EU MS	- -	- -
Legal reference to monitoring	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Type of Monitoring (Pressures / States)	Pressure / state	Pressure / state	Pressure / state	Pressure / state	Pressure / state	Not Applicable	Pressure / state	Not Applicable
Monitoring MFSD Descriptors	5, 8, 9, 10	5	3	3	8, 9	- -	2	- -
Derived legislation								
Reporting obligations	Yes, general.	Yes, specifically set for monitoring	Yes, general		Yes, specifically set for monitoring	- -	Yes, specifically set for monitoring	- -

International Conventions

This section provides a review and analysis of the existing international conventions and other regulatory documents regarding monitoring obligations.

- Bonn Convention on Migratory Species (CMS), 1979;
- United Nations Convention on the Law of the Sea (UNCLOS), 1982.
- United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement);
- London Convention on Marine Pollution and Dumping on Wastes and Other Matter, 1972;
- Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Protocol), 1996;
- Convention on Biological Diversity (CBD), 1992;
- Cartagena Protocol on Biosafety to the Convention on Biological Diversity, 2000;
- Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity, 2010;
- International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL Convention, Protocol and Annexes);
- International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001.
- International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004;

As for previous sections, a synthesis of the analysis conducted is given in Table 3.10 and Table 3.11, where monitoring provisions set up by international conventions are presented, as well as indications on the MSFD Descriptors related to the object of such monitoring.

Table 3.10: Synthesis of the International Conventions: legal status, monitoring provisions and links with the MSFD

	Bonn Convention / CMS	UNCLOS	UN Fish Stocks Agreement	London Convention	Protocol to the London Convention	CBD	Cartagena Protocol to the CBD	Nagoya Protocol to the CBD
Status	Signed 1979 – In force.	Signed in 1982. In force in 1994	Signed in 1982 In force in 2001	Signed in 1972 In force in 1975	Signed in 1996 In force in March 2006	Signed 1992, in force in 1993.	Signed in 2000 In force in 2004	Signed in 2010. Not in force.
IRIS SES countries*	Ratified by all except for Turkey	Signed by all except for Turkey	Signed by all except for Turkey	Ratified by all except for Romania & Turkey.	Not ratified by Croatia, Cyprus, Greece, Malta, Romania & Turkey	Ratified by all	Ratified by all	Signed by all except for Croatia, Malta & Turkey.
Legal reference to monitoring	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Type of Monitoring	--	State	Pressure / state	Pressure / state	Pressure / state	State	State	--
Monitoring MFSD Descriptors	--	8, 9, 10, 11	3	8, 9, 10	8, 9, 10	1, 2, 3, 4, 6	1, 3, 4, 6	--
Derived legislation	Strategic Plan for MS (2015-2023) & Action Plans							
Reporting obligations	--	Yes, specifically set for monitoring.	Yes, general.	Yes, specifically set for monitoring.	Yes, specifically set for monitoring.	Yes, general.	No	--

Table 3.11: Synthesis of the International Conventions: legal status, monitoring provisions and links with the MSFD

	MARPOL Convention & Protocol	Annex 1 MARPOL Convention	Annex 2 MARPOL Convention	Annex 3 MARPOL Convention	Annex 4 MARPOL Convention	Annex 5 MARPOL Convention	Annex 6 MARPOL Convention	Convention Harmful Antifouling Systems on Ships	Control & Management of Ships' Ballast Water & Sediments
Status	Convention signed in 1973 Protocol signed in 1978	In force 1983	In force 1983	In force 1992	In force 2003	In force 1988	In force 2005	Signed in 2001 In force in 2008	Signed in 2004 Not in force
IRIS SES countries*	Signed by all.	Signed by all.	Signed by all.	Signed by all, except Romania & Turkey	Signed by all except for Turkey	Signed by all.	Signed by all.	Ratified by all except for Turkey	Ratified by Croatia, France and Spain
Legal reference to monitoring	Yes	Yes	No	No	No	No	No	Yes	Yes
Type of Monitoring	Pressure	Pressure	--	--	--	--	--	State	State
Monitoring MFSD Descriptors	8, 9	8, 9	--	--	--	--	--	1, 8, 9	2, 8, 9
Derived legislation									
Reporting obligations	Yes, general.	Yes, general.	--	--	--	--	--	Yes, under request by other CPs.	Yes, general.

Other relevant Conventions

This section provides a summary of the information collected regarding the inventory of the two regional conventions and related recommendations examined for their provisions on monitoring:

- Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area, 1996 (ACCOBAMS Agreement);
- The European Landscape Convention (also Florence Convention), 2000;
- Recommendation CM/Rec(2008)3 of the Committee of Ministers to Member States on the guidelines for the implementation of the European Landscape Convention.

Table 3.12: Synthesis of the Regional Conventions: legal status, monitoring provisions and links with the MSFD

	ACCOBAMS Agreement	European Landscape Convention
Status	Signed in 1996 In force in 2001	Signed in 2000 In force in March 2004
IRIS SES countries	Ratified by all except for Turkey	Signed by all countries, Ratified by all except for Malta.
Legal reference to monitoring	Yes	No
Type of Monitoring (Pressure / state)	State	Not Applicable
Associated MFSD Descriptors	1, 11	1
Derived legislation		Recommendation CM/Rec (2008)3 of the Committee of Ministers to Member States on the guidelines for the implementation of the European Landscape Convention (containing monitoring obligations on landscape changes)
Reporting obligations	Yes, specifically set for monitoring	- -

3.1.4 DISCUSSION AND CONCLUSION

The MSFD requires EU MS to establish monitoring programmes for the ongoing assessment of the environmental status of their marine waters according to eleven environmental Descriptors. According to article 11, “Monitoring programmes shall be compatible within marine regions or sub-regions and shall build upon, and be compatible with, relevant provisions for assessment and monitoring laid down by Community legislation, including the Habitats and Birds Directives, or under international agreements”; in addition, “Specifications and standardised methods for monitoring and assessment which take into account existing commitments and ensure comparability between monitoring and assessment results, and which are designed to amend non-essential elements of this Directive by supplementing it, shall be adopted in accordance with the regulatory procedure with scrutiny referred to in Article 25(3)”.

In this context, monitoring activities need to be designed to allow assessing whether GES has been achieved or is maintained; measuring progress towards environmental targets; and evaluating the effectiveness of measures to achieve or maintain GES. Monitoring programmes need to take into consideration an indicative list of environmental characteristics, pressure and impacts on marine and coastal ecosystems, yet should also be able to detect and assess emerging issues. Their design and implementation should be done in a way allowing them to result in integrative assessments encompassing existing monitoring programmes and comparable within and between marine regions and/or sub-regions.

The present deliverable has listed and reviewed the existing regional and international regulations framing monitoring obligations of marine and coastal environments in the Mediterranean and Black Seas. Its final purpose is to contribute to the development of an integrated interdisciplinary monitoring programme, which is to be jointly implemented by all EU MS in the Mediterranean and Black Seas. The assessment of such legislative texts highlights both the current legal coverage and the existing gaps concerning monitoring obligations in both basins, along with the understanding of the present and future needs to meet MSFD requirements.

To this date, most of the regional and international legislation bodies reviewed have

been designed to address specific issues (e.g. oil spills, offshore pollution, dumping and pollution from ships, introduction of alien species, etc.) and, therefore, are not particularly focusing on the general status of the marine environment nor targeting its good environmental status, with the notable exception of the WFD. Not all the texts reviewed include provisions for monitoring as understood in the context of the MSFD. However, when existing, requirements remain rather imprecise: Parties are generally expected to design and implement monitoring systems, although no detail is provided regarding specific environmental objectives, methods or criteria, etc. thus leaving the text open to interpretation. This is particularly the case for the reviewed international and regional conventions.

Table 3.13: Monitoring provisions included in International Conventions regarding MSFD Descriptors.

	Potentially covered
	Not covered
	Indirectly covered

REGULATION	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
Bonn Convention / CMS											
UNCLOS											
UN Fish Stocks Agreement											
London Convention											
Protocol to the London Convention											
CBD											
Cartagena Protocol to the CBD											
Nagoya Protocol to the CBD											
MARPOL Convention & Protocol											
Annex 1 MARPOL Convention											
Annex 2 MARPOL Convention											
Annex 3 MARPOL Convention											
Annex 4 MARPOL Convention											
Annex 5 MARPOL Convention											
Annex 6 MARPOL Convention											
Convention Harmful Antifouling Systems on Ships											
Control & Management of Ships' BW & Sediments											

As it is shown in

Table **3.13** and Table 3.14, monitoring provisions included in international conventions address few aspects related to MSDF Descriptors. A large part of the international and regional regulations (8 out of 19) have no monitoring requirements; in the remaining texts, monitoring obligations are mostly related to pollution issues (Descriptors 8 and 9) (7 out of 17), while only five regulations target at least one biodiversity issue (CBD and related Protocol, UN Fish Stocks Agreement, Harmful Antifouling Systems on Ships and Ballast Waters and Sediments). Finally, concerning D10 and D11, only three legal instruments require marine litter to be monitored (UNCLOS, the London Convention and its Protocol), whereas underwater noise monitoring obligations are only set by UNCLOS and the ACCOBAMS Agreement.

Table 3.14: Monitoring provisions included in regional agreements regarding MSFD Descriptors

REGULATION	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
ACCOBAMS Agreement											
European Landscape Convention											

Regarding Regional Sea Conventions, the Barcelona and the Bucharest Conventions were first adopted to control marine pollution in the Mediterranean and the Black Seas, yet their mandates have gradually widened to meet the needs for a transversal vision to sea management, on contrary to traditional sectorial approaches. Monitoring programmes have been launched in both basins although their thematic scope differs. In the context of the Barcelona Convention, the MEDPOL Programme is responsible for the application of the Protocols addressing marine pollution, and it has been assisting Mediterranean countries in the formulation and implementation of pollution monitoring programmes from land-based sources for several decades. These monitoring activities may respond to some of the MSFD requirements, particularly those related to pollution by chemical and hazardous substances as well as nutrient pollution (Table 3.15).

Table 3.15: Monitoring provisions included in the Barcelona Convention and related Protocols regarding MSFD Descriptors

REGULATION	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
Barcelona Convention											
Dumping protocol											
Emergency Protocol											
LBS Protocol											
SPA/BD Protocol											
Offshore Protocol											
Hazardous Wastes Protocol											
ICZM Protocol											

It should be highlighted, however, that the current implementation of the MAP's Ecosystem Approach Initiative (in close cooperation with the EC) is likely to result in a more integrative monitoring programme in the Mediterranean basin.

The Black Sea Commission, on its side, has recently approved the Black Sea Integrated Monitoring and Assessment Programme (BSIMAP, 2002) to meet the monitoring requirements set by the Bucharest Convention, which aims at assessing a wide range of environmental aspects and which may meet a large part of the monitoring needs set up by the MSFD (Table 3.16).

Table 3.16: Monitoring provisions included in the Bucharest Convention and related Protocols regarding MSFD Descriptors

REGULATION	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
Bucharest Convention											
LBS Protocol											
LBSA Protocol											
Emergency Protocol											
Dumping Protocol											
Biodiversity and Landscape Conservation Protocol											
SAP of the Black Sea											

In the context of the EU, monitoring provisions regarding marine and coastal environments exist in a number of European regulations (directives, regulations, decisions

and directive proposals) (Table 3. **17** and Table 3.16). Some of these legislative texts also focus on concrete environmental issues (e.g. Habitats and Birds Directives), while others make up complex and holistic framework regulations which formulate ambitious work programmes aiming at achieving GES (e.g. the Water Framework Directive (2000/60)).

Table 3. 17: Monitoring provisions included in the European regulations regarding MSFD Descriptors

REGULATION	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11
MSFD (reference)											
WFD											
Decision 2455/2001/EC											
Directive 2008/32/EC											
EQS Directive											
Habitats Directive											
Birds Directive											
Bathing Waters Directive											
Urban Waste Water Directive											
Nitrates Directive											
Council Regulation (EC) No 199/2008											
Commission Decision 2010/93/EU											
Commission Regulation (EC) 1881/2006											
Invasive Alien Species Directive Proposal											
ICZM and MSP Directive Proposal											

European legislation often sets up requirements for a coherent and comprehensive overview of environmental status; according to this fact, and taking into consideration its binding nature on EU MS, it is likely that many EU MS (and therefore, the EU IRIS-SES countries) have already put in place monitoring programmes addressing some of the MSFD requisites, particularly those related to biodiversity and pollution both by nutrient and chemical substances.

As a final consideration, it is worthwhile to note that the key to the analysis of the monitoring provisions included in regulations (international and regional) is the assessment of the compliance of the IRIS-SES countries with legal requirements as established in the conventions to which they are CPs. Leaving aside European regulations, which are binding on

EU MS and which their non-compliance gives rise to sanctions, it should be assessed whether countries have adopted measures concerning monitoring activities to comply with the conventions ratified and, in such cases, what are the practical outcomes from the implementation of such measures.

3.2 SOCIOECONOMIC ASSESSMENT OF HUMAN ACTIVITIES, ANALYSIS AND TRENDS OF ENVIRONMENTAL PRESSURES FOR THE DESIGN OF MONITORING PLANS

3.2.1 INTRODUCTION

The analysis of environmental pressures in the context of the IRIS-SES Project

The EU pilot project IRIS-SES (Integrated Regional monitoring Implementation Strategy in the South European Seas) aims to build a new approach and develop decision making tools for an integrated marine monitoring as required by the Marine Strategic Framework Directive (2008/56/EC), in order to support an effective management of anthropogenic activities in marine waters of the Mediterranean and Black Seas.

IRIS –SES intends to reach the above target through five structured objectives:

- Development of integrated monitoring strategies built on the running monitoring programmes;
- Development of multidisciplinary monitoring guidelines and integrated ecosystem surveys;
- Development of strategic approaches to monitor anthropogenic pressures;
- Development of integrated monitoring tools and programmes at sea regions scales;
- Planning for joint monitoring programmes (JMPs) in pilot regions of the under study regional seas, based whenever possible on existing monitoring programmes, looking for their optimization, in order to improve their adequacy to MSFD sampling requirements.

These objectives have been achieved through a 20 month work plan structured into activities and tasks.

The main aim of the Activity 1 (Analysis of the monitoring programmes carried on the framework of European/ regional/ national legislation in relation to MSFD requirements), as has been described before, is the preparation of a catalogue and a comprehensive analysis of the existing monitoring programs related to European directives and other international and regional conventions in the Mediterranean and Black Seas, in order to assess the contribution of these programs to meeting the MSFD needs.

In view of the design of JMPs in the framework of the MSFD, Task 2 of Activity 1 aims at developing a review of data availability on pressures exerted on marine and coastal ecosystems of Mediterranean and Black seas. Furthermore, it intends to provide an analysis on the main human activities that take place directly in (or in close vicinity of) marine and coastal environments, by reference to the needs for an integrated monitoring of pressures.

Several subtasks have been defined to undertake the analysis:

e) Undertake an inventory and critical assessment of the legislation regulating the marine environment monitoring of Mediterranean and Black Seas, with a focus on supra national legal instruments (EU directives and Regulations, Regional Sea Conventions and their Protocols, other Regional and International Conventions).
f) Gather and assess data on human activities and associated pressures and impacts in the marine environment
g) Assess future trends of the human activities leading to future environmental pressures.
h) Consider the need for monitoring data (i.e. address data gaps) to support future assessments and managerial actions.

The outputs of these subtasks are presented in two deliverables and in two associated Excel databases.

Results of subtasks b), c) and d) are presented in this deliverable and in its associated MS Excel database "1.2_IRIS_SES_PlanBleu_AnalysisPressures_bcd". They together correspond to Specific Deliverable 6 of Activity 1, as referenced in the project "Description of the Action".

Results of subtask a) are displayed in a different deliverable, "Inventory of the regional and international legislations regulating the marine environment monitoring in the

South European Seas". Its associated MS Excel database is "1.2_IRIS_SES_PlanBleu_Analysis_Pressures_a" (http://iris-ses.eu/wp-content/uploads/2015/08/1.2_IRIS-_SES_PlanBleu_Analysis_Pressures_a.xlsx).

Scope and content

This deliverable aims to identify key elements allowing the development of future monitoring programs focusing specifically on environmental pressures in the Mediterranean and Black Sea basins, in countries considered under the IRIS-SES Project (i.e. Bulgaria, Croatia, Cyprus, France, Greece, Italy, Malta, Romania, Slovenia, Spain and Turkey). It is built on three main analyses closely interlinked, which are related to the MS Excel database complementing this report.

The first section, "Economic and social assessment of drivers in the Mediterranean and Black Seas", aims at setting the socioeconomic context of the study area. It provides information on the current picture of human activities –drivers- linked to coastal and marine ecosystems of the countries considered in the IRIS-SES Project, i.e. EU countries bordering the eastern and southern Black Sea and the Mediterranean northern and eastern rims, and Turkey.

The second part, entitled "Future trends in human activities and links with current and future environmental pressures in the Mediterranean and Black Seas", evaluates pressures derived from human uses in both basins and examines potential changes of environmental pressures on marine ecosystems, based on the expected evolution of human activities in the two regions in the mid/ long term.

Finally, the section "Considerations on the need for monitoring data to support future assessments and managerial actions" aims at identifying data gaps and at highlighting monitoring needs regarding environmental pressures, in order to guide future monitoring efforts and support the development of coherent future Joint Monitoring Programs (JMC) in the context of the MSFD, while remaining consistent with ongoing regional strategies (e.g. the Bucharest and the Barcelona Conventions).

Key concepts

- The Business As Usual (BAU) scenario:

The Business As Usual (BAU) scenario is considered in this report as a reference scenario based on the analysis of future trends expected for socioeconomic activities in the Mediterranean and Black Seas, involving no major interventions or paradigm shifts in their organization or functioning. It takes into account both environmental pressures and impacts on marine ecosystems.

The BAU acknowledges recent tendencies resulting from the economic crisis in both the Mediterranean and Black Sea basins. It assumes a loosening of economic coherence among EU MS (including Romania and Bulgaria in the Black Sea area) and towards countries of the neighbouring zone around the Mediterranean. It also considers a slowing down of the strong engagement undertaken by the EU over the last decades regarding environmental policies, as economic recovery has been prioritized over environmental and conservation issues. Following the turmoil of the Arab Spring, northern African and eastern Mediterranean economies are slowly recovering; in contrast, the reconstruction of economies after the collapse of the former Soviet Union is still in process. In this context, Turkey is expected to keep on affirming its political, economic and demographic strength in both the Mediterranean and the Black Sea basins. In addition, it is worth noting that the two basins will face a number of disputes concerning the use of the maritime space. Some of them are longstanding, whereas new conflicts have arisen from the gradual extension of national sovereignties over the maritime space and as a consequence of jurisdictional overlaps and the creation of new boundaries.

- The Ecosystem Approach

Issued from the Convention on Biological Diversity, the Ecosystem Approach (EA) is a paradigm aiming to reach a balance between three objectives: the conservation of ecosystems and biodiversity, their sustainable use, and achieving an equitable sharing of benefits arising from the utilization of natural resources. The MSFD requires EU MS to implement EA principles to support decision making and manage human activities in a more sustainable manner in order to achieve Good Environmental Status (GES) of European

marine environments. In addition, the Mediterranean Action Plan (MAP), as executory body of the Barcelona Convention, has come to complement the EU action in the entire Mediterranean basin through the implementation of the Ecosystem Approach Initiative (EcAp), aiming to achieve GES of marine and coastal ecosystems.

- The Mediterranean Action Plan's Ecosystem Approach Initiative (EcAp)

Through Decision IG.17/6, the Contracting Parties (CPs) to the Barcelona Convention, recognizing the severe threats and damages caused by intense human activities on marine and coastal ecosystems, adopted in 2008 a roadmap to implement the Ecosystem Approach Initiative (EcAp), which aims at reaching the Vision of "a healthy Mediterranean with marine and coastal ecosystems that are productive and biologically diverse for the benefit of present and future generations". The EcAp Initiative is articulated through a rational and strategic process, going from the definition of the ecological Vision for the Mediterranean and the setting of common strategic goals, to the development and periodic review of relevant action plans and programmes of measures. The overall objective is to move forward towards a more effective ecosystem-based management of human activities in the Mediterranean region and to achieve GES of marine and coastal ecosystems.

Decision IG.20/4 on "Implementing the Ecosystem Approach Roadmap", following up on Decision IG.17/6, validated the work done so far regarding the 11 ecological objectives, operational objectives and indicators for the Mediterranean. It also mandated the Secretariat to prepare an EcAp Monitoring Programme, to determine GES and targets and to prepare an in-depth socio-economic analysis of human activities that impact on, or benefit from, the quality and ecological health of coastal and marine ecosystems. Finally, it asked to integrate EcAp in the overall work of UNEP/MAP Barcelona Convention and mandated the Secretariat to establish an EcAp governance framework. In particular the EcAp process in the Mediterranean is implemented in synergy and coherence with the EU's MSFD principles.

- The Millennium Ecosystem Assessment

The present deliverable assesses interactions between socioeconomic activities and marine ecosystems as a basis to develop effective monitoring programmes. In addition, the characterization and quantification of links between the economic, social and environmental

spheres provides knowledge allowing making informed decisions about the appropriate use of natural resources. In this sense, the concept of ecosystem services has been developed over the last two decades in order to integrate economic and ecological sciences into an operational decision support system. In ecosystem service assessments, ecologists focus on the ecosystem and organism characteristics required to deliver services, while economists explore methods to determine the value of services to human well-being.

In 2001, the UN initiated the Millennium Ecosystem Assessment (MEA) to evaluate the consequences of ecosystem changes for human welfare. Ecosystem services were defined as goods and services –benefits- that ecosystems provide to human well-being. The work carried out under the MEA (2005) involved the classification of ecosystem services into four different categories: supporting (e.g. nutrient cycling), regulating (e.g. water purification), provisioning (e.g. food and water), and cultural services (e.g. recreation).

- Environmental pressures

Environmental pressures are defined as the mechanism through which an activity has an effect on any part of the ecosystem. Pressures can be physical (e.g. abrasion), chemical (e.g. introduction of synthetic components) or biological (e.g. introduction of microbial pathogens) (Knights *et al*., 2011)[3].

- Environmental impacts

Environmental impacts are defined as the adverse consequence(s) of pressures on any part of the ecosystem where the change is beyond that expected under natural variation given prevailing conditions (Knights *et al*., 2011).

- Good Environmental Status

Good Environmental Status (GES) is defined as the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the uses of the marine

[3] Knights, A.M., Koss, R.S., Papadopoulou, N., Cooper L.H. and L.A. Robinson. 2011. Sustainable use of European regional seas and the role of the Marine Strategy Framework Directive. Deliverable 1, EC FP7 Project (244273) 'Options for Delivering Ecosystem-based Marine Management'. University of Liverpool. ISBN: 978-0-906370-63-6: 165 pp.

environment are made at a sustainable level, thus safeguarding its potential for current and future generations (Knights *et al*., 2011). Marine strategies applying to the Mediterranean region, both the MSFD to be implemented by EU MS and MAP's EcAp by CPs to the Barcelona Convention, should culminate in the execution of programmes of measures designed to achieve or maintain GES of their jurisdictional waters.

3.2.1 RESULTS

3.2.2 Economic and social assessment of drivers in the Mediterranean and Black Seas

The objective of the first subtask is to provide information on the current socioeconomic picture of human activities –drivers- impacting marine and coastal ecosystems of the countries considered in the IRIS-SES Project, which border the eastern and southern Black Sea and the Mediterranean northern and eastern rims. To this end, official descriptive data and indicators characterizing socioeconomic activities influencing the basins have been gathered and presented.

METHODS

The information collected concerns human activities taking place in the Mediterranean and Black Seas, to describe the economic and social context of the Mediterranean and Black Sea basins. Each economic sector is characterized according to several aspects: first, in order to give an insight of the magnitude of the activity, a series of descriptive indicators are provided, such as the sector's production and/ or infrastructure; second, indicators on the sector's economic performance, i.e. production value and/ or gross added value (GVA), are included; finally, to characterize social impacts of economic activities, employment figures are presented. In addition, trends regarding the recent evolution of each economic sector have also been indicated, when available.

The main information and data sources have been the Initial Assessments (IAs) delivered to the EC during 2012 and 2013 by EU MS. The data provided by countries was generally reported at the national level. However, Mediterranean countries with maritime

façades belonging to different sub-regions presented occasionally information aggregated at a sub-national level, according to the different geographical sub-basins: Western Mediterranean, Adriatic Sea, Ionian Sea and Central Mediterranean and Aegean-Levantine basin.

Information has been collected in a MS Excel database (accompanying the present deliverable) entitled: 1.2_IRIS_SES_PlanBleu_AnalysisPressures_bcd. The Excel sheet "b) ESA Black & Med Seas" includes the economic and social analysis (ESA) of Mediterranean and Black Sea drivers (http://iris-ses.eu/wp-content/uploads/2015/08/1.2_IRIS_SES_PlanBleu_AnalysisPressures_bcd.xlsx).

Details on the structure of the data gathered are shown in Table 3.18 and Table 3. **19**.

Table 3.18: Economic and social assessment of Mediterranean and Black Seas drivers (I)

A	B	C	D	E	F	G	H	I	J	K
Country (1)	**Sub-Basin (2)**	**Activity (3)**	**Infrastructure (4)**				**Production (4)**			
Text	Text	Text	Figures	Year	Trend	Period	Figures	Year	Trend	Period

(1) and (2) As previously stated, some of the socioeconomic data have been compiled at the national level. However, when possible, the sub-basin scale has been considered, since higher geographical/ spatial scales share common environmental features and may be more relevant from the physical, chemical and biological perspective.

(3) According to categories of activities listed in Annex 4 of the Commission Staff Working Paper[4].

(4) Data on human activities' infrastructure and production, as well as indication on observed recent trends (when available).

[4] Commission Staff Working Paper, Relationship between the initial assessment of marine waters and the criteria for GES, 2011.

Table 3. 19: Economic and social assessment of Mediterranean and Black Seas drivers II

L	M	N	O	P	Q	R	S	T	U	V	W	X
Production Value (Million Euro) (5)				**Value Added (Million Euro)**				**Employment (umber) (6)**				**Source/ Ref.**
Figures	Year	Trend	Period	Figures	Year	Trend	Period	Figures	Year	Trend	Period	Text

(5) Data on sector's economic indicators (production value and GVA), along with related recent trends (when available).

(6) Data on the sector's social impact (employment) and observed recent trends (when available).

RESULTS

The analysis has been carried out for Bulgaria, Cyprus, France, Greece, Italy, Romania Slovenia and Spain, according to the MSFD IAs. Data are lacking for Malta, Croatia and Turkey: the socioeconomic section of Malta's IA was still not publicly available at the time of delivering the present analysis. Croatia, which recently accessed the EC, will join the second cycle of the MSFD. Finally, Turkey, as EU candidate state, has no reporting obligations on European directives.

In total, the ESA database contains 83 registers, each register characterizing one of the economic activities reported to the EC by EU MS in the Mediterranean and Black Seas. As an example of the outputs, two extracts of the socioeconomic analysis of current human activities (drivers) operating in Mediterranean and Black Sea basins are presented in Table 3.20 and Table 3.21.

Table 3.20: Economic and social assessment of the Mediterranean Sea. An extract from the Italian socioeconomic analysis

Sub-Basin	Activity	Infrastructure				Production				Prod. value (M. Euro)				Value Added (M. Euro)				Employment (nº employees)			
Text	Text	Figures	Year	Trend	Period	Figures	Year	Trend	Period	Figures	Year	Trend	Period	Figures	Year	Trend	Period	Figures	Year	Trend	Period
Adriatic Sea	Fisheries							decreasing	2000-10	470	2010	fluctuant - decreasing	2008-10	290	2010	fluctuant - decreasing	2008-10	10 000	2010	increasing	2008-10
Ionian & Central Med	Fisheries							decreasing	2000-10	320	2010	fluctuant - decreasing	2008-10	170	2010	fluctuant - decreasing	2008-10	8 000	2010		2008-10
Western Med.	Fisheries							decreasing	2000-10	320	2010	fluctuant - decreasing	2008-10	190	2010	fluctuant - decreasing	2008-10	11 000	2010		2008-10
Total country	Industry	2500 companies (PRTR register)	2007-09	stable		Industrial prod. index 88,4	2011	increasing	2009-11												
Western Med/ Ionian	Offshore Gas Extraction	1 off. gas platform	2011			Re-gasification capacity 3.5 Gscm	2011	stable	2008-11	35	2011	decreasing	2009-11					74	2011		
Adriatic Sea	Offshore Gas Extraction	1 off. gas platform	2011			Re-gasification capacity 8 Gscm	2011	stable	2008-11									125	2011		
Adriatic Sea / Ionian	Offshore Oil Extraction	Adr. Sea: 13 active platf. Ionian: 19 platf.	2012			640 000 tons oil	2011	stable	2008-11	403	2011							12 000	2011		
Total country	Ports	534 comm. ports	2010							8 200	2009	increasing	2007-09	3 000	2009	increasing	2007-09	44 000	2009		
Total country	Shipping					490 M.tons cargo 87 M.pass.	2010	decreasing	2009-10	11 000	2009			4 000	2009			78 500	2009		
Total country	Shipbuilding	16 000 companies	2010	stable	2009-10					4 400	2009			1 150	2009			12 000	2009		
Total country	Aquaculture	642 farms	2009			120 000 tons seawater sp (105 000 t shellfish)	2010	stable	2005-10	475	2009	fluctuant	2007-09					6 900	2007		
Adriatic Sea	Aquaculture	490 plants	2008																		
Western Med.	Aquaculture	50 plants	2008																		
Total country	Agriculture	1,6 million farms	2010	decreasing	2002-10					39 000	2010	increasing	2002-10	22 000	2010	stable	2008-10	950 000	2010	stable	2002-10
Total country	Tourism			increasing	2002-08					4 000	2007							500 000	2006		
Total country	Recreational boating									3 400	2010	decreasing	2008-10	800	2010	decreasing	2008-10	20 000	2010	decreasing	2008-10

Table 3.21: Economic and social assessment of the Black Sea. An extract from the Romanian socioeconomic analysis.

Sub-Basin	Activity	Infrastructure				Production				Prod.value (M. Euro)				Value Added (M. Euro)				Employment (nº employees)			
Text	Text	Figures	Year	Trend	Period	Figures	Year	Trend	Period	Figures	Year	Trend	Period	Figures	Year	Trend	Period	Figures	Year	Trend	Period
Black Sea	Fisheries					338 tons	2011	decreasing	2005-2010	1	2011	stable	2009-2011	0,23% PIB		decreasing	2004-	633	2005	decreasing	2005-2011
Black Sea	Seaweed & other Seafood	4 areas shellfish production				218	2011														
Black Sea	Ports	4 Ports				45 M. Tons	2010	increasing	2009-2010									400 (only Constanta harbour);	2012?	decreasing	2009-2012
Black Sea	Shipping					19 000 passengers	2010	fluctuant	2007-2010									13 000 (Black Sea profile)			
Black Sea	Shipbuilding	3 shipyards								790	2010	decreasing	2007-2010					20 000			
Black Sea	Tourism	14 touristic resorts				3 M. hotel overnight stays	2011	decreasing since 2007	2006-2011					540	2009	decreasing	2009-2011	7 800	2010	stable	2006-2010
Black Sea	Coastal Industry	5 industrial sectors (chemical, oil & energy industries)						increasing	2008-2010					1 180	2010	decreasing	2008-2010	52 000	2010	decreasing	2008-2010
Black Sea	Urban development	15 urban centres (>2000 and < 150 000 eq)																			
Black Sea	Offshore HC explotation	4 offshore platforms				330 000 Tons oil 1 140 000 smc gas	2011	increasing (oil); fluctuant (gas)	2006-2011	160	2011	increasing	2006-2011								

3.2.3 Future trends of human activities and current and future environmental pressures in the Mediterranean and Black Seas

The objective of the second subtask is to describe future trends expected for socioeconomic activities in EU MS bordering the Mediterranean and Black Seas, according to a BAU Scenario. The final goal of the subtask consists of identifying future environmental pressures, derived from economic sectors taking place in both basins along with their impacts, in order to support the development of monitoring programmes focusing on marine and coastal ecosystems.

METHODS

Few countries have provided indications on the expected evolution of their economic activities in their MSFD IA reports. Therefore, information on future trends is principally based on already available prospective analyses and scenario forecasting studies. The present assessment has only taken the BAU scenario into consideration (see section 3.2).

Economic trends need to be taken into consideration for the development of the future JMPs, as they may help predicting and identifying future pressures –increasing, decreasing or stabilizing- on coastal and marine ecosystems and, therefore, potential needs of monitoring. In view of the increasing efforts that are being made to decouple environmental pressures and impacts from human activities, the BAU Scenario as considered in the present deliverable does take into account current and planned environmental measures to address future pressures. The MSFD, the Integrated Maritime Policy, the MAP's Ecosystem Approach Initiative (EcAp) or BSC strategies, among others, are comprehensive tools aiming to implement coordinated and sustainable management of human uses and activities, and are believed to have a future beneficial effect on the environmental status of marine ecosystems.

The analysis is structured in two parts. The first section (Table 3.22) focuses on the relationships between human activities -as categorized in Annex 4 of the Commission Staff

Working Paper- and environmental pressures and impacts on coastal and marine ecosystems, as listed in Annex III of the MSFD. In addition, environmental pressures have been associated to MSFD descriptors, criteria and pressure indicators as developed in Annex II of the Commission Staff Working Paper. Indeed, different categories of indicators (impact, pressure or state) have been defined and used to characterize each MSFD descriptor.

Displaying links between economic activities, pressures and pressure indicators allows highlighting the environmental pressures for which indicators have already been defined and are already monitored (or may start being monitored). Similarly, it also supports the identification of gaps in pressure surveillance that need to be included in the design of the future monitoring programs in the Mediterranean and Black Seas.

Table 3.22: Human Activities and links with MSFD Pressure Indicators

A	B	C	D	E	F	G	H	I
Activity theme	**Activity**	**Pressures (current)**	**Impacts (current)**	**Pressure Indicator (according to MSFD)**			**MSFD Descriptor**	**EcAp EO**
Key words	Key words	Key words	Key words	Criterion	Description (MSFD)	Category P: Pressure I: Impact S: State	Key words	Key words

On the other hand, the second part of the assessment (Table 3. **23**) involves the examination of future trends – according to a BAU Scenario - of the main socioeconomic activities that have been object to prospective studies in both basins. Efforts made at the regional and international levels to decouple drivers from pressures in order to mitigate impacts (i.e. directives, regional sea conventions, action plans, initiatives and other type of regulations) have been taken into account to provide more realistic indications on the expected future pressures in the Mediterranean and Black Seas. The overall objective is to anticipate which pressures are likely to threaten marine and coastal ecosystems in the two basins according to the expected development and evolution of human activities, provided that no major shifts in management paradigms occur.

Table 3. 23: Human Activities, Future Trends and Future Pressures

A	B	J	K	L	M	N	O	P	Q
Activity theme	**Activity**	**Trends BAU Scenario**		**Measures**		**Future Pressures**		**Future Pressures**	
Key words	Key words	Black Sea	Med. Sea	Black Sea	Med. Sea	Trends	Black Sea	Trends	Med. Sea

Information has been collected and analysed in a MS Excel database entitled: 1.2_IRIS_SES_PlanBleu_AnalysisPressures_bcd. The Excel sheet "c) Env. Pressures, Future Trends" contains the analysis of future trends expected for socioeconomic activities in the Mediterranean and Black Seas, as well as current and future expected environmental pressures derived from such activities and links with impacts.

RESULTS

General categories of human activities have been inventoried, i.e. Extraction of living resources; Food production; Man-made structures; Extraction of non-living resources; Energy production; Maritime Transport; Waste disposal; Tourism and recreation; Research and survey; Military activities; and Land-based activities and industries. Detailed activities as well as associated environmental pressures and impacts have been listed correspondingly, and links between environmental pressures and MSFD pressure indicators are also presented. An extraction of the final output is shown in Table 3.25.

Pressures for which indicators have been defined are shown in bold. Among all MSFD indicators set up to assess the status of the marine environment, only 15 rigorously correspond to "pressure indicators" and might directly address environmental pressures originating from human activities (Table 3.24). Neither Descriptor 1 (Biological diversity) nor Descriptor 4 (Food webs) or D6 (Seafloor integrity) are addressed by pressure indicators.

However, one of the impact indicators defined for Descriptor 6 has been taken into consideration in the present analysis, i.e.: "*6.1.2. Extent of the seabed significantly affected by human activities for the different substrate type*"; since it focuses on the spatial

distribution of seafloor impacts, it may also provide indication on the spatial distribution of pressures. In fact, this indicator 6.1.2 is very similar to a pressure indicator established to address Descriptor 7 (i.e. "7.1.1. *Extent of the area affected by permanent alterations*"), which also targets the spatial distribution of (hydrological) alterations (Table 3.24).

Future trends are detailed for some of the principal socioeconomic activities directly or closely linked to marine environments. These are:

- Agriculture and forestry run-off;
- Coastal urbanization and development;
- Damming (human demand for water resources);
- Tourism frequentation and yachting;
- Desalination/ water abstraction;
- Land claim, coastal defence;
- Port operations;
- Submarine cable and pipeline operations;
- Shipping;
- Hydrocarbon extraction;
- Marine-based renewable energy generation;
- Fisheries and Aquaculture;
- Marine Research and Survey.

Table 3.24: MSFD Criteria and Indicators regarding Environmental Pressures

MSFD Desc.	Pressure Indicator (according to MSFD)		
	Criterion	Description (MSFD)	P / I
1		**Na**	P
2	2.1 Abundance and state characterization of non-indigenous species, in particular invasive species	2.1.1.Trends in abundance, temporal occurrence and spatial distribution in the wild of non-indigenous species, particularly invasive non-indigenous species, notably in risk areas, in relation to the main vectors and pathways of spreading of such species	P
3	3.1 Level of pressure of the fishing activity	3.1.1.Fishing mortality (F)	P
3	3.1 Level of pressure of the fishing activity	3.1.2.Ratio between catch and biomass index (catch/biomass ratio)	P
4		**Na**	
5	5.1 Nutrients level	Nutrient load	P

5	5.1 Nutrients level	5.1.1.Nutrient concentration in water column	P
5	5.1 Nutrients level	5.1.2. Nutrient ratios (Si:N:P)	P
6	*6.1 Physical damage, having regard to substrate characteristics*	*6.1.2.Extent of the seabed significantly affected by human activities for the different substrate types*	*I*
7	7.1 Spatial characterisation of permanent alterations	7.1.1.Extent of area affected by permanent alterations	P
8	8.1 Concentration of contaminants	8.1.1. Concentration of contaminants in the relevant matrix (biota, sediment, water) ensuring comparability with WFD.	P
8	8.2 Effects of contaminants	8.2.2.Occurrence, origin, extent of significant acute pollution events & impact on biota physically affected by this pollution	P/I
9	9.1 Levels, number and frequency of contaminants	9.1.1.Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels	P/I
9	9.1 Levels, number and frequency of contaminants	9.1.2.Frequency of regulatory levels being exceeded	P/I
10	10.1 Characteristics of litter in the marine and coastal environment	10.1.1.Trends in the amount of litter washed ashore and/or deposited on coastlines, incl. analysis of its composition, spatial distribution and source (where possible)	P
10	10.1 Characteristics of litter in the marine and coastal environment	10.1.2.Trends in the amount of litter in the water column (incl. floating at the surface) and deposited on the seafloor, incl. analysis of its composition, spatial distribution and source (where possible)	P
10	10.1 Characteristics of litter in the marine and coastal environment	10.1.3.Trends in the amount, distribution and, where possible, composition of micro-particles (in particular micro-plastics)	P
11	11.1 Distribution in time and place of loud, low and mid frequency impulsive sounds	11.1.1. Proportion of days and their distribution within a calendar year over areas of a determined surface, as well as their spatial distribution, in which anthropogenic sound sources exceed levels that are likely to entail significant impact on marine animals measured as Sound Exposure Level (in dB re 1uPa2.s) or as peak sound pressure level (in dB re 1uPapeak) at on metre, measured over the frequency band 10 Hz to 10 kHz.	P
11	11.2 Continuous low frequency sound	11.2.1.Trends in the ambient noise level within the 1⁄3 octave bands 63 and 125 Hz (centre frequency) (re 1uPa RMS: average noise level in these octave bands over a year) measured by observation stations and/or with the use of models if appropriate	P

To determine pressures that may be threatening the marine and coastal environments of the Mediterranean and Black Seas in the coming years, not only socioeconomic trends have been taken into account, but also legal instruments currently implemented in the area (EU directives and regional conventions, action plans, protocols and initiatives) as well as planned legislation. In this sense, it is understood that even if high development rates are expected for a given socioeconomic activity, environmental pressures may be slightly decoupled provided that legislation or mitigation measures are in place or

planned. In particular, in the Black Sea area transposition of more strict European legislation by Bulgaria and Romania may result in environmental benefits for coastal and marine ecosystems.

Table 3.25: Future trends in human activities, current pressures and future pressures resulting from human activities in the Mediterranean and Black Seas. Land-based activities/ industries - Agriculture and Forestry run-off.

Activity theme	Activity	Pressures (current)	Impacts (current)	Pressure Indicator (according to MSFD)			MSFD Descrip.	EcAp EO (Med)	Economic Trends BAU Scenario		Measures		Future Pressures BAU Scenario			
K. words	Key words	Key words	Key words	Criterion	Description (MSFD)	P / I			Black Sea	Med. Sea	Black Sea	Med. Sea	Black Sea		Mediterranean Sea	
Land-based activities/ industries	Agriculture and forestry run-off	**Introduction of synthetic and non-synthetic substances and compounds**	Contamination of marine ecosystem components by hazardous substances	8.1 Concentration of contaminants	8.1.1. Concentration of contaminants in the relevant matrix (biota, sediment, water) ensuring comparability with WFD.	P	8, 9	9	Slow recovery in the agricultural sector, although with lower impacts than before 1989 Strong agronomic potential for Romania. Romania and Bulgaria relevant as major exporters of agricultural products to the Black Sea region.	Expansion in the North of a highly technology- and capital-based 'precision' agriculture, while sustainable development policies remain insufficient Decreasing/ more efficient use of fertilizers Overexploitation of water resources for irrigation	EU MSFD; EU WFD; BEP regarding pesticides; Ban on dangerous pesticides; Black Sea SAP	EU MSFD; EU WFD; BEP regarding pesticides; Ban on dangerous pesticides; MAP LBS Protocol	- / ?	BEP may help reducing inputs to marine environments of pesticides and dangerous compounds from agriculture; However, increase and development of the agriculture sector may involve pressure rising.	-	BEP may help reducing inputs of pesticides from agriculture
				8.2 Effects of contaminants	8.2.2.Occurrence, origin, extent of significant acute pollution events and their impact on biota physically affected by this pollution	P/I										
				9.1 Levels, number and frequency of contaminants	9.1.1.Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels	P/I										
					9.1.2.Frequency of regulatory levels being exceeded	P/I										
		Inputs of nitrogen and phosphorous-rich substances and organic matter	Nutrient and organic matter enrichment - Eutrophication	5.1 Nutrients level	Nutrient load	P	5	5			BEP regarding fertilizers; Black Sea SAP and LBSA Protocol.	BEP regarding fertilizers; MAP LBS Protocol	-		-	
					5.1.1.Nutrient concentration in water column	P										
					5.1.2. Nutrient rations (Si:N:P)	P										
		Reduction of freshwater and sediment inflows	Changes in hydrological regimes	7.1 Spatial characterisation of permanent alterations	7.1.1.Extent of area affected by permanent alterations	P	7	7					++		++	

3.2.4 Need for monitoring data to support future assessments and managerial actions

The final subtask aims at linking the two previous assessments (i.e. the socioeconomic characterization of the Mediterranean and the Black Sea basins and the evaluation of current and future environmental pressures according to a BAU Scenario) to identify data gaps and to highlight monitoring needs regarding pressures on marine and coastal ecosystems, with the final objective of guiding monitoring efforts and supporting the development of coherent future JMP.

METHODS

The analysis on monitoring gaps and needs has been based on the work conducted by Zampoukas *et al.* (2012)[5], a comparative review regarding monitoring parameters as set up by the MSFD (listed in Annex III, MSFD) and those already addressed in the framework of ongoing monitoring programs, either related to other EU Directives or to regional conventions. In this case, since the analysis is focused on environmental pressures, only the MSFD pressure indicators identified in the previous subtask have been considered. In this way, pressure indicators have been linked to the monitoring parameters listed in MSFD annexes (Columns A-E,Table 3.26).

On the other hand, to evaluate whether ongoing surveillance programs may satisfy (any of) the MSFD requests, monitoring obligations required by other regulations have been reviewed and reported (Columns F-M).

[5] Zampoukas N., Piha H., Bigagli E., Hoepffner N., Hanke G. and Cardoso AM. (2012) Monitoring for the Marine Strategy Framework Directive: Requirements and Options, European Commission – Joint Research Center, Scientific and Technical Research Reports.

Table 3.26: Monitoring gaps and needs according to ongoing surveillance programs

A	B	C	D	E	F	G	H	I	J	K	L	M
MSFD Descriptor	**Pressure Indicator (according to MSFD)**			**Monitoring Parameters**	**Related Pressure Monitored Parameters (ongoing monitoring programmes)**					**Regional Conventions**		
Key words	Criterion	Description (MSFD)	P / I	Description (MSFD)	Birds Directive	Env. Quality Standards Directive	Habitats Directive	CFP	WFD	MAP MEDPOL*	BSIMAP**	GFCM

The monitoring programs considered are being carried out in the framework of several EU Directives, i.e. Birds, Habitats, Environmental Quality Standards (EQS), Water Framework Directive (WFD) and Common Fisheries Policy (CFP), and/ or regional conventions such as the Barcelona Convention and the MAP/ MEDPOL monitoring programme; the Bucharest Convention and the Black Sea Integrated Monitoring and Assessment Programme (BSIMAP); and the General Fisheries Commission for the Mediterranean (GFCM) (Table 3.26).

Finally, a synthesis has been made to enable visualizing monitoring gaps both in coastal and marine areas (according to WFD boundaries), for the Black and Mediterranean seas (Columns N-R, Table 3. **27**).

Table 3. 27: Monitoring gaps and needs - Synthesis

SYNTHESIS				
N	O	P	Q	R
Existing monitoring Black Sea		**Existing monitoring Mediterranean Sea**		**Clarification**
Transitional/ Coastal	Marine	Transitional/ Coastal	Marine	

The assessment has been conducted using a MS Excel database gathering data and information (1.2_IRIS_SES_PlanBleu_AnalysisPressures_bcd) (http://iris-ses.eu/wp-content/uploads/2015/08/1.2_IRIS_SES_PlanBleu_AnalysisPressures_bcd.xlsx). The evaluation of data gaps and monitoring needs has been carried out in the final sheet of the database, named “d) Monitoring gaps”.

RESULTS

Monitoring gaps regarding environmental pressures are in accordance with what has been observed for most of the data gaps regarding impacts and states of marine environments in the Mediterranean and Black Seas: most of the MSFD Descriptors (and related indicators) appear at least partially addressed by one or more parameters measured by ongoing monitoring programs. However, this partial description is found insufficient to understand the magnitude and trends of pressures affecting marine ecosystems over the MSFD jurisdictional area. An extract of this last analysis is shown in Table 3.28 and Table 3.29, for three MSFD Descriptors (D2, D8, and D9). The parameters required for assessment by the MSFD and being already monitored by other programmes are shown in bold.

Table 3.28: Monitoring needs for D2

MSFD Descript.	Pressure Indicator (according to MSFD)			MSFD Monitoring Parameters	Related Pressure Monitored Parameters					Regional Conventions		
	Criterion	Description (MSFD)	P / I	MSFD	Birds Direct.	EQS Direct.	Habitats Direct.	CFP	WFD	MAP / MEDPOL	Black Sea /BSIMAP	GFCM
2	2.1 Abundance and state characterisation of non-indigenous species, in particular invasive species	2.1.1.Trends in abundance, temporal occurrence and spatial distribution in the wild of non-indigenous species, particularly invasive non-indigenous species, notably in risk areas, in relation to the main vectors and pathways of spreading of such species	P	**2. Angiosperms sp. composition and its annual/ seasonal variability** **3. Fish abundance** **5. Fish distribution** 11. Introduction of non-indigenous sp. 12. Invertebrate bottom fauna biomass and its annual/ seasonal variability **13. Invertebrate bottom fauna sp. composition** and its annual/ seasonal variability 14. Macro-algae biomass **15. Macro-algae sp. composition** 20. Non-indigenous or exotic sp. abundance 21. Non-indigenous or exotic sp. Occurrence 22. Non-indigenous or exotic sp. spatial distribution **27. Phytoplankton sp. compositions** and its geographical and seasonal variability 37. Translocations of non-indigenous sp. 38. Zooplankton sp. compositions and its geographical and seasonal variability	N	N	N	14. Species (data from fisheries-independent research surveys) 16. Species abundance (data from fisheries-independent research surveys) 24. Discards of sp. (based on observer trips) 26. Discards abundance (based on observer trips)	2. Angiosperms Composition 8. Benthic Invertebrate Fauna Composition 14. Macro-algae Sp. Composition 18. Phytoplankton Composition	N	Identification of exotic species; Identification of vectors of introduction	N

SYNTHESIS					
MSFD Descript.	Existing monitoring Black Sea		Existing monitoring Mediterranean Sea		Clarifications
	Transitional/ Coastal	Marine	Transitional/ Coastal	Marine	Key words
2	WFD, CFP, BSC	CFP, BSC	WFD, CFP	CFP	Monitoring obligations only for some non-indigenous species. Seasonal and geographical variations are not included.

N: no pressure parameters are monitored under this regulation.

Table 3.29: Monitoring needs for D8 and D9

MSFD Descript.	Pressure Indicator (according to MSFD)			MSFD Monitoring Parameters	Related Monitored Pressure Parameters					Regional Conventions		
	Criterion	Description (MSFD)	P / I	MSFD	Birds Direct.	EQS Direct.	Habitats Direct.	CFP	WFD	MAP / MEDPOL	Black Sea /BSIMAP	GFCM
8	8.1 Concentration of contaminants	8.1.1. Concentration of contaminants in the relevant matrix (biota, sediment, water) ensuring comparability with WFD.	P	**42. Concentration of contaminants**	N	1. Specific synthetic pollutants for sediment and/or biota 2. Specific non-synthetic pollutants for sediment and/or biota	N	N	20. Specific synthetic pollutants 21. Specific non-synthetic pollutants	Y	Y	N
8	8.2 Effects of contaminants	8.2.2.Occurrence, origin, extent of significant acute pollution events and their impact on biota physically affected by this pollution	P/I	41. Biological effects of contaminants	11. Adverse effect of chemical pollution on population levels or birds species	1. Specific synthetic pollutants for sediment and/or biota 2. Specific non-synthetic pollutants for sediment and/or biota	N	N	20. Specific synthetic pollutants 21. Specific non-synthetic pollutants	Y	N	N
9	9.1 Levels, number and frequency of contaminants	9.1.1.Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels	P/I	42. Concentration of contaminants	N	N	N	N	N	N	Y	N
9	9.1 Levels, number and frequency of contaminants	9.1.2.Frequency of regulatory levels being exceeded	P/I	42. Concentration of contaminants	N	N	N	N	N	N	N	N

N: no pressure parameters are monitored under this regulation.

SYNTHESIS

MSFD Descript.	Existing monitoring Black Sea		Existing monitoring Mediterranean Sea		Clarifications
	Transitional/ Coastal	Marine	Transitional/ Coastal	Marine	Key words
8	WFD, EQS, BSC	BSC	WFD, EQS, MAP	N	
8	WFD, EQS, BD	N	WFD, EQS, BD,MAP	N	Birds Directive (BD): only for protected bird species
9	BSC	BSC	N	N	
9	EC*	EC*	EC*	EC*	*Commission Regulation 1881/2006: regulation on several pollutant contents (trace metals, dioxins, PCBs, PAHs) on fish, crustaceans, cephalopods and bivalve molluscs.

In this sense, the spatial gap is among the most evident data gaps, since the majority of the parameters are being measured only in coastal waters, particularly those being an object of other European legislations (e.g. WFD). It is worth noting that the WFD has allowed developing rather well-designed monitoring programs among EU MS, which already address some of the MSFD Descriptors (D2, D5, D6, D7, and D8) through several parameters.

Nonetheless, while the WFD applies to coastal waters (i.e. to 1 nm from the baseline), the MSFD is to be applied to marine waters under the jurisdiction of each EU Member State. In the case of the countries having enforced Economic Exclusive Zones (EEZ) or other maritime jurisdictions, this may extend up to 200 nm.

Therefore, deeper waters remain mostly uncovered by monitoring, in particular regarding environmental pressures, both for the Black Sea and Mediterranean basins. Offshore areas are hence monitored by few survey programmes, mostly issued from the Common Fisheries Policy or Commission Regulation 1881/2006. The first is principally related to commercially exploited species (Descriptor 3), although several indicators also deal with the characterization of non-indigenous species (Descriptor 2). Commission Regulation 1881/2006 sets up maximum levels of contaminants on foodstuff, and is directly linked to Descriptor 9 (Contaminants in fish and other seafood).

On the other hand, some of the MSFD Descriptors and related indicators are not addressed at least by one of the parameters included in ongoing monitoring programs; these are considered as “immature Descriptors” (Zampoukas et al., 2012). Among these, Descriptor 10, regarding “Marine litter”, and Descriptor 11, regarding “Underwater noise/ Energy,” must be highlighted.

CONCLUSION

The MSFD requires the EU MS to design and implement effective monitoring systems of their marine waters as a step of the roadmap towards achieving GES. In the context of the IRIS-SES Project, aiming to support the development of JMP, the objective of the present deliverable is to provide an assessment of the current monitoring gaps regarding

environmental pressures affecting marine ecosystems of both the Black Sea and the Mediterranean.

New monitoring initiatives will need to address the eleven Descriptors set by the MSFD and at the same time encompass existing monitoring programmes in both basins. In this respect, the present report aims to support and contribute to this task by undertaking three different and complementary assessments to highlight current monitoring gaps and needs in the two basins.

First, a socioeconomic assessment has been conducted regarding current human activities taking place in EU MS and exerting environmental pressures on Black Sea and Mediterranean ecosystems. It has been built on the information included in the MSFD Initial Assessments submitted by the EU MS to the EC and has focused on sectors of high economic and social relevance such as fisheries, aquaculture, tourism and recreational activities, hydrocarbon exploitation or maritime transport and shipbuilding.

A second part of the deliverable has included an analysis of the expected evolution of the main socioeconomic sectors of the Mediterranean and Black Sea basins in the mid/ long term, according to a BAU Scenario. The main purpose is to anticipate drivers that will be increasing their activities in the coming years and to identify environmental pressures that, in accordance, are likely to intensify in both basins. In addition, pressures derived from the human activities considered have been linked to the eleven MSFD Descriptors and the corresponding pressure indicators that have been established to facilitate the implementation of the directive. In this respect, it has been found that fifteen pressure indicators have been set up to address pressures affecting the majority of the environmental aspects considered by the MSFD, i.e.: D2 (indigenous species), D5, D8, and D9 (nutrient and chemical pollution), D7 (Hydrological alterations), as well as D10 and D11 (Marine litter and Energy inputs). No indicators have been defined to characterize pressures on biodiversity (D1) or seafloor integrity (D6), although pressures affecting the latter might be addressed *in extremis* by an impact indicator. It is worth noting that for some of the Descriptors less assessed such as D10 (marine litter) and D11 (underwater noise), several pressure indicators have been set up to facilitate the design of monitoring programmes and also the definition of the aspects to be monitored.

Finally, the third part of the deliverable has presented links between pressures, MSFD Pressure Indicators and MSFD Monitoring Parameters, and assessed whether the latter are object of already ongoing monitoring programmes. The final objective is to highlight gaps and point out monitoring needs to be taken into consideration for the design of the monitoring programmes to comply with the MSFD.

Some of the European environmental regulations, targeting transversal issues (Habitats or Birds Directives) or focusing on the marine environment directly or indirectly (such as the CFP and the WFD), might have resulted in ongoing monitoring activities also addressing some of the MSFD Descriptors.

In the context of the Regional Sea Conventions, monitoring programs have been put in place both in the Mediterranean and Black Seas. The MAP/ MEDPOL Monitoring Program, in the Mediterranean, and the Black Sea Integrated Monitoring and Assessment Program (BSIMAP), in the Black Sea, are based on national monitoring programs and financed by the CPs to the respective Conventions. In the case of the Mediterranean Sea, surveillance programs focus exclusively on nutrient and pollution issues and on the identification of Mediterranean pollution hotspots. In contrast, the BSIMAP is a relatively young monitoring program (approved in 2002) with an integrative vision of the coastal and marine ecosystems, aiming at producing a complete environmental assessment of the Black Sea every five years. Consequently, it targets a variety of environmental issues which may already be related to a large number of MSFD Descriptors.

An overview of the links between the requisites of the MSFD concerning monitoring (of environmental pressures) met by European regulations and regional conventions is presented in Table 3.30. Few MSFD requisites are currently met by ongoing programmes in the Mediterranean or the Black Sea. In both basins, survey activities might already target -at least partially- some environmental aspects related to the majority of the Descriptors. However, monitoring programmes might mostly focus on coastal areas, whereas deeper (offshore) areas remain little surveyed. In the Mediterranean Sea, only D2 and D3 might be addressed both in coastal and deep areas, while no monitoring activity may be focusing on D10 and D11. On the other hand, in the Black Sea several of the MSFD Descriptors may

already be addressed both in coastal and deep areas as a result of the implementation of the BSIMAP, although none of the monitoring programmes targets D11.

However, efforts are currently being made in both basins to design effective and integrative monitoring programs and, undoubtedly, such efforts will take into consideration the requirements of the MSFD as many of their riparian countries are EU MS. Both the BSC and the MAP, as Convention's executive bodies, have launched projects in cooperation with the European Commission's Environment Directorate-General regarding the implementation of the MSFD and its harmonization with regional sea initiatives and strategies. Some of these projects are specifically related to the design and implementation of marine ad coastal environmental monitoring. In addition, in the context of the Mediterranean Sea and the Barcelona Convention, the MAP is also implementing the EcAp Initiative in accordance to MSFD principles. The EcAp Initiative may result, among many other things, in the design of a renovated and more integrative monitoring program for the Mediterranean Sea, encompassing both the MSFD Descriptors and the MAP's Ecological Objectives.

Table 3.30: Assessment of the coverage by ongoing monitoring programmes of the MSFD

MSFD Descript.	Criterion related to Pressure Indicators	EU Environmental Legislation						Regional Conventions		
		Birds Directive	EQS Directive	Habitats Directive	CFP	WFD	Comm. Reg. 1881/2006	MAP / MEDPOL	BSC / BSIMAP	GFCM
2	2.1 Abundance and state characterisation of non-indigenous species, in particular invasive species									
3	3.1 Level of pressure of the fishing activity									
5	5.1 Nutrients level									
6	6.1 Physical damage, having regard to substrate characteristics									
7	7.1 Spatial characterisation of permanent alterations									
8	8.1 Concentration of contaminants									
8	8.2 Effects of contaminants									
9	9.1 Levels, number and frequency of contaminants									
10	10.1 Characteristics of litter in the marine & coastal environment									
11	11.1 Distribution in time and place of loud, low & mid frequency impulsive sounds									
11	11.2 Continuous low frequency sound									

Potentially covered | Indirectly covered | Indirectly covered | coastal / marine

ANNEX I. Header rows of each sheet used for the inventory of the monitoring programmes

Descriptors 1,4,6 - Birds	*Month(s)/ Season(s)*	*Start of data series*	*Details*	*Key species*	*Type of population*[5]	*N individuals*[6]	*N nesting pairs*[7]	*Reproductive success*[8]	*Additional variables*[9]									
Descriptors 1,4,6 - Mammals	*Month(s)*	*Species*	*Details*	*Start of data series*	*N individuals*[5]	*N pups/calves*[6]	*Additional variables*[7]											
Descriptors 1,4,6 - Fish	*Station*	*LAT__DEC_D*	*LON__DEC_D*	*Sampling depth interval*	*Month*	*Season*	*Species/ Community*	*Start of data series*	*Species level taxonomy*[5]	*Relative abundance*[6]	*Length*[7]	*Relative biomass*[8]	*Sex*[9]	*Age*[10]	*Maturation age*[11]	*Stomach content*[12]	*Additional variables*[13]	
Descriptors 1,4,6 – Seabed habitats Phytobenthos	*Station*	*LAT__DEC_D*	*LON__DEC_D*	*Month /season*	*Start of data series*	*Species level taxonomy*[5]	*Species biomass*[6]	*Species coverage*[7]	*Total biomass*[8]	*Total coverage*[9]	*Maximum depth distribution of communities*[10]	*Substrate type*[11]	*Additional variables*[12]					
Descriptors 1,4,6 – Seabed habitats Zoobenthos	*Station*	*LAT__DEC_D*	*LON__DEC_D*	*Month /season*	*Start of data series*	*Species level taxonomy*[5]	*Relative abundance*[6]	*Relative biomass*[7]	*Size distribution of dominant species*[8]	*Additional variables*[9]								
Descriptors 1,4,6 –Water column habitats Phytoplankton	*Station*	*LAT__DEC_D*	*LON__DEC_D*	*Month*	*Season*	*Start of data series*	*Species level taxonomy*[5]	*Relative abundance*[6]	*Relative biomass*[7]	*Additional variables*[8]								

Descriptors 1,4,6 –Water column habitats Zooplankton	*Station*	*LAT__DEC_D*	*LON__DEC_D*	*Month*	*Season*	*Start of data series*	*Species level taxonomy*[5]	*Relative bundance*[6]	*Relative biomass*[7]	*Developmental stages*[8]	*Sex*[9]	*Additional variables*[10]						
D2 – Non Indigenous Species	*Station*	*LAT__DEC_D*	*LON__DEC_D*	*Month*	*Season*	*Species/ Community*	*Start of data series*	*Species level taxonomy*[5]	*Relative abundance*[6]	*Relative biomass*[7]	*Pathway of spreading*[8]	*Additional variables*[9]						
D3 – Commercial Fish and Shellfish	*Station*	*LAT__DEC_D*	*LON__DEC_D*	*Sampling depth interval*	*Month*	*Season*	*Species/ Community*	*Start of data series*	*Species level taxonomy*[5]	*Relative abundance*[6]	*Length*[7]	*Relative biomass*[8]	*Sex*[9]	*Age*[10]	*Maturation age*[11]	*Stomach content*[12]	*Additional variables*[13]	
D5 - Eutrophication	*Station*	*LAT__DEC_D*	*LON__DEC_D*	*Bottom depth*	*Surface/water column*	*Month/Season*	*Start of data series*	*PO4_FREQ*[5]	*TP_FREQ*[6]	*DOP_FREQ*[7]	*SIO4_FREQ*[8]	*TNOx_FREQ*[9]	*NO2_FREQ*[10]	*NH4_FREQ*[11]	*TN_FREQ*[12]	*DON_FREQ*[13]	*POC_FREQ*[14]	*DOC_FREQ*[15]
	HumicSubs_FREQ[16]	*Chla_FREQ*[17]	*Dissolved Oxygen_FREQ*[18]	*Secchi_FREQ*[19]	*Additional*[20]													
D7 - Hydrographical changes	*Station*	*LAT__DEC_D*	*LON__DEC_D*	*Bottom depth*	*Surface/ water column*	*Month/Season*	*Start of data series*	*Tem_FREQ*[5]	*Sal_FREQ*[7]	*Curr_FREQ*[9]	*pH_FREQ*[11]	*Alkal_FREQ*[13]	*Additional*[15]					

D8 - Contaminants in water	*Station*	*LAT__DEC_D*	*LON__DEC_D*	*Bottom depth*	*Sampling depth*	*PAH[5]*	*PCBs[6]*	*TBT[7]*	*DDT and metabolites[8]*	*HCH[9]*	*Pb[10]*	*Cd[11]*	*Hg[12]*	*Additional[13]*				
D8 - Contaminants in sediments	*Station*	*LAT__DEC_D*	*LON__DEC_D*	*Bottom depth*	*PAH[5]*	*PCBs[6]*	*TBT[7]*	*DDT and metabolites[8]*	*HCH[9]*	*Pb[10]*	*Cd[11]*	*Hg[12]*	*Additional[13]*					
D8 - Contaminants in biota	*Station*	*LAT__DEC_D*	*LON__DEC_D*	*Bottom depth*	*Species*	*Organ*	*PAH[5]*	*PCBs[6]*	*TBT[7]*	*DDT and metabolites[8]*	*HCH[9]*	*Pb[10]*	*Cd[11]*	*Hg[12]*	*Effects[13]*			
D9 - Contaminants in seafood	*Station*	*LAT__DEC_D*	*LON__DEC_D*	*Bottom depth*	*Species for consumption*	*Organ*	*PAH[5]*	*PCBs[6]*	*TBT[7]*	*DDT and metabolites[8]*	*HCH[9]*	*Pb[10]*	*Cd[11]*	*Hg[12]*	*Legislation[13]*	*Additional[14]*		
D10 - Marine Litter	*Amount of beach litter[5]*	*Amount of litter in the water[6]*	*Amount of litter in the sea bottom[7]*	*Distribution of litter[8]*	*Litter ingested by marine animals[9]*	*Additional[10]*												
D11 - Energy&Noise	*Type of activity[5]*	*No. of days[6]*	*Duration: short or long lasting[7]*	*Additional[8]*														