GROWTH AND INNOVATION IN OCEAN ECONOMY GAPS AND PRIORITIES IN SEA BASIN OBSERVATION AND DATA

EMODNET MEDITERRANEAN SEA CHECKPOINT

D12.5 Final Report
(03/06/2015– 03/06/2017)

Total number of pages: 22

Workpackage	**12**	Project Management	
Author(s):	Nadia Pinardi		INGV

A project funded by:
EUROPEAN COMMISSION, DIRECTORATE-GENERAL FOR MARITIME AFFAIRS AND FISHERIES, MARITIME POLICY ATLANTIC, OUTERMOST REGIONS AND ARCTIC

Document Log

Date	Author	Changes	Version	Status
07/08/2017	N.Pinardi	Structure and contents	V1	completed
09/08/2017	N.Pinardi	Outlook	V2	completed
21/08/2017	N.Pinardi and S.Simoncelli	General corrections	V3	completed

Table of Contents

Executive Summary

This final report overviews the results and the outputs of the Mediterranean Sea Checkpoint project.

The project started activities in December 2013 and ended June 2017 and it was extended six months to complete the work of implementation of the metadatabase and the second Data Adequacy Report (DAR) which contains all the major findings of the Project.

The project started a new type of service, the "Checkpoint Service" where the monitoring system of the Mediterranean Sea can be objectively assessed with ISO-compliant criteria within an INPIRE framework. This is a unique effort that is aimed at becoming a permanent assessment framework for EMODnet if decided to be so in the future.

The Service is based upon the creation of a metadatabase on all the upstream or input data sets required to meet the needs of "Challenge" products. Such a metadatabase includes assessment indicators that evaluate the "fitness for use" of the upstream data for the final products required by the Challenges. In the specific case of the Mediterranean Sea only 7 Challenges were considered, generating 45 ad-hoc Targeted Products out of about 100 data sets.

The Checkpoint service approach allows assessing the monitoring system on the basis of "monitoring characteristics" which include environmental variables or object positions or administrative units or in general human activities. The assessment revealed that, even if at a first glance more than 250 input data sets were available, only 96 were ready to be used and some of them had not sufficient quality in terms of coverage, resolution, upgrade frequency, etc. The assessment results are all reported in the second DAR that outlines the major gaps in the basin-scale observing system. The mandatory project outputs are listed in the Section 5 of this report and they were all delivered.

The project demonstrated that a service to assess the basin scale monitoring system can be set up so that upgrades and gaps can be objectively assessed by stakeholders requirements. In the future it is recommended to continue the Checkpoint activity as a statistical service that accumulates information and upgrades the assessment bi-yearly and that also interfaces with stakeholders in a continuous manner in order to decide the Challenges.

Introduction

The objective of EMODnet Mediterranean Sea CheckPoint is to assess how monitoring meets the needs of public and private users by generating Challenge products that are related to societal needs and requirements. The required Challenge outputs for the Mediterranean Sea are listed in Table 1.

Challenge	Information product to be delivered (requested by tender)
CH1-Windfarm siting	Suitability of sites for wind farm development
CH2-Marine Protected Areas	Representativeness and coherency of existing European network of marine protected areas (national and international sites) as described in article 13 in the Marine Strategy Framework Directive.
CH3-Oil Platform leak	Likely trajectory of a leak from an oil platform and the statistical likelihood that sensitive coastal habitats or species or tourist beaches will be affected within 24 hours and after 72 hours.
CH4-Climate and Coastal Protection	Spatial data layers for the following parameters for the past 10 years, the past 50 years and the past 100 years • average annual change in temperature at surface, midwater and sea-bottom • average annual sea-level rise at the coast (absolute and relative to the land) • sediment mass balance at the coast Time plots for the following parameters for the whole sea basin • average annual sea temperature over sea-basin at surface, mid-water column and bottom. • average annual changes in internal energy of sea
CH5-Fisheries Management	• tables for the whole sea-basin of mass and number of landings of fish by species and year • mass and number of discards and bycatch (of fish, mammals, reptiles and seabirds) by species and year • data layers (gridded) showing the extent of fisheries impact on the sea floor • area where bottom habitat has been disturbed by bottom trawling (number of disturbances per month) • change in level of disturbance over past ten years
CH6-Marine Environment	data layers (gridded) showing • Seasonal averages of eutrophication in the basin for past ten years • Change in eutrophication over past ten years (i.e. where eutrophication has reduced and where it has increased)
CH7-Rivers	for each river bordering the sea basin, the country where it enter the sea and a time series of annual inputs from rivers of • water • sediment • total nitrogen • phosphates

	• eels monthly averages, maxima and minima for these parameters over the past ten years

Table 1 CheckPoint Mediterranean Sea Challenges required outputs.

The products and the assessment of the quality of the required monitoring data sets were delivered *through a Web input data set catalogue and a product portal*.

An assessment of the marine environmental monitoring capacity based upon final products of direct societal benefit has never been attempted before so the MedSea Checkpoint developed an entirely new methodology at the same time implementing it for the required products.

The two Data Adequacy Reports (DAR) which contain the main results of the project have been reviewed and discussed with a Expert Panel composed of:

1) Monika Peterlin - environmental agency
2) Miguel Bernal - regional international organization for fisheries
3) Jan Erik Hanssen - private industry
4) Alberto Lamberti - academia – coastal engineering
5) Piero Lionello - academia – climate science of the Mediterranean Sea

The draft versions of the two DARs were reviewed and accepted by the Expert Panel.

In this report we will overview the major steps of the MedSea Checkpoint project and the final results. Section 1 will describe the final Checkpoint methodology that was partially developed in the Literature Survey and the First DAR, Section 2 will describe the Challenge Targeted Products actually produced and in the third Section we will overview the final Checkpoint assessment and the gap analysis done in the second DAR. An outlook section concludes the report.

1. Checkpoint Methodology and Service

The general methodology is shown in Fig. 1.

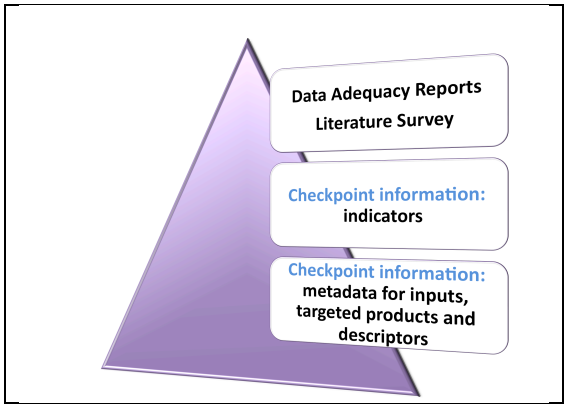

Fig. 1 The Checkpoint framework

The Checkpoint assessment framework is based upon three major pillars:

1) use of the ISO principles for the methodological development and the metadata definition of input data sets (the monitoring data sets);
2) design of the metadatabase containing the information about the input data sets, the Targeted products and the quality indicators;
3) definition of indicators for the objective assessment of the data adequacy following INSPIRE rules.

The ISO principles used to describe the input data sets can be found in the open access EMODnet MedSea Checkpoint browser, available here: http://www.emodnet-mediterranean.eu/browser/. All input data sets for the Challenges are described and catalogued following the SeaDataNet vocabulary for monitored "Characteristics", i.e., "a distinguishing feature which refers to:

- a variable derived from the observation or the measurement;
- a numerical model output of a phenomenon;
- an object property in the environment;
- a geographical representation of an object on a map (i.e. a layer such as a protected area, a coastline or wrecks) by a set of vectors (polygon, curve, point)
- a raster (a spatial data model that defines space as an array of equally sized cells such as a grid or an image)."

Each input data set is then classified in terms of which characteristics it refers, the spatial and temporal structure of the data set, the environmental matrix, the data producer and the original use of the data set.
The assessment framework followed two main paths:
1) an expert opinion on the quality of the Challenge Targeted products and their related input data set adequacy;
2) a set of "indicators" that classify the "fitness for use" of the input data sets and the "fitness for purpose" of the targeted products

For the indicator path, two assessment "Territories" were chosen:

Territory 1: Availability **How** the input data sets are made available to Challenges
Territory 2: Appropriateness **What** is the quality of the monitoring data for the Challenge products

Table 2 The two territories of the assessment

Eight indicators have been chosen for each territory, in particular:

Territory 1: availability	
Definitions	Name of Availability indicators
Visibility Indicators	
Easily found	**AV-VI-1**
EU Inspire Catalogue service	**AV-VI-2**
Accessibility Indicators	
Policy visibility	**AV-AC-1**

Delivery	**AV-AC-2**
Data Policy	**AV-AC-3**
Pricing	**AV-AC-4**
Readiness	**AV-AC-5**
Performance Indicator	
Responsiveness	**AV-PE-1**

Table 3 Availability indicators nomenclature

and

Territory 2: appropriateness	
Definitions	Name of Appropriateness Quality Elements
Completeness (ISO)	
Horizontal Spatial Coverage	**AP-1-1**
Vertical Spatial Coverage	**AP-1-2**
Temporal Coverage	**AP-1-3**
Accuracy (ISO)	
Horizontal Resolution	**AP-3-1**
Vertical Resolution	**AP-3-2**
Temporal Resolution	**AP-3-3**
Thematic Accuracy	**AP-3-4**
Temporal Quality (ISO)	
Temporal Validity	**AV-4-1**

Table 4 Appropriateness indicators nomenclature

Each appropriateness indicator corresponds to an ISO quality element which has been adapted to the Checkpoint needs.

Indicators provide both an overview of the situation at a high level of aggregation as well as detailed information about trends and links. The difficult task is to find an appropriate balance between simplification and completeness and offer, at the same time, an assessment of the input data sets without directly accessing all the metadata.
For Territory 1 indicators the Checkpoint has defined 4-6 possible values for the different availability indicators (described in detail in the Annex 3 of the second DAR). For Territory 2 the indicators are more complicated and a schematic is offered in Fig. 2. Thus appropriateness indicators are "errors" defined as the difference between the required monitoring input data set (DPS) and the actual Upstream Data used (UD).
For each territory we defined a "color scale" with the following meaning:

Red: urgent actions are required to provide datasets and services fitting for use – totally inadequate
Yellow: limited actions are required to provide datasets and services fitting for use – partly adequate
Green: actions and services are fit for use and should be maintained – fully adequate

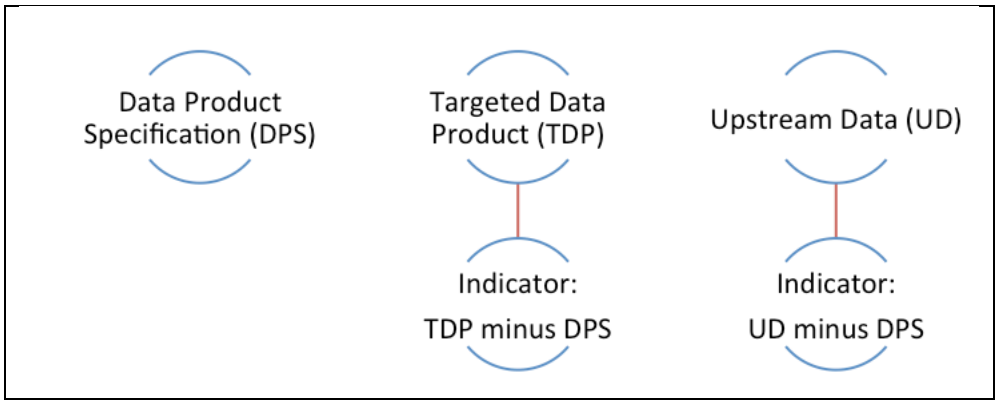

Figure 2 High level scheme for the appropriateness indicators: Quality Elements are decided for DPS and reproduced for TDP and UD so that a "difference" (TDP minus DPS or UD minus DPS) can be calculated and this gives indicator values.

Following INSPIRE rules, all the input data sets, the upstream data sets and the Targeted products have been displayed in a Web Portal available to everybody for discovery: http://www.emodnet-mediterranean.eu/. In this Portal a Checkpoint Service has been defined and implemented: http://www.emodnet-mediterranean.eu/checkpoint-service/.

Each Challenge has a proper page (http://www.emodnet-mediterranean.eu/challenges/) where the input data sets are listed and the Targeted products realized displayed.

At the time of the project end, the dashboard reporting on the indicators on the Web was not implemented so that the indicator results are available only through the second DAR and the different annexes.

2. Challenge Targeted Products

All the seven Challenge Targeted products were achieved except for one of the Challenge 4 products: "Spatial data layers for the sediment mass balance at the coast for the past 10 years, the past 50 years and the past 100 years". This by itself makes the most important gap in monitoring the Mediterranean Sea. Such data set is normally composed of: sediment flux from rivers, sediment grain size and their mineralogy, resuspension rates and critical shear stresses, lateral sediment mass fluxes, etc.
All the remaining Challenges could generate a product but with different kind of "fitness for purpose" due to different problems in the "fitness for use" of the input data sets. 45 targeted products were generated and they are briefly described in Appendix 1 to this report.
The first evaluation of the products was achieved by expert opinion, answering the following question for each product:

1. Assign an overall product quality score with respect to scope (fitness for purpose) and explain why, according to the scale in Table 5.

2. Explain what is (are) the most important characteristic(s) for the Targeted Product quality (if all characteristics are important please say so);
3. Explain what is (are) the quality element(s) (see Annex 1) of the most important characteristic(s) that affects the Targeted Product quality;
4. Explain the limitations on the quality of Targeted products due to the input data set used;
5. Explain which characteristics "fails the most" to meet the scope of the Targeted Product;
6. Provide an expert judgement to describe for each Targeted Product the most important gaps in the input data sets.

SCORE	MEANING
1	EXCELLENT → it meets completely the scope of the Targeted Product
2	VERY GOOD → it meets more than 70% of the scope of the Targeted Product
3	GOOD → it meets less than 70% of the scope of the Targeted Product
4	SUFFICIENT → it does not really meet the scope but it is a starting point
5	INADEQUATE → it does not really fulfil the scope, not usable

Table 5 Scores for expert opinion about the fitness of purpose of the targeted products

Table 6 summarizes the quality scores given by the project experts. The Targeted products with lowest "fitness for purpose" are:

1. Challenge 5 (fishery management) products encountered the largest problems since of the data are not available at appropriate time.
2. Challenge 7 (river inputs) produced a low accuracy product since the quality of the input data is low.
3. Challenge 4 reported a lack of information on the sediment mass balance and gaps on the sea level data which do not allow to compute long time series directly from measurements so that only reconstructed time series are possible.
4. Challenge 2 faced the issue of assessing MPA connectivity at the whole basin scale where some crucial data sets are missing, i.e. larval behavior and spawning time. Furthermore the Challenge products are not based on a sound methodology yet. The assessment of MPA network representativeness is still an open research issue.

TP	CH1	CH2	CH3	CH4	CH5	CH6	CH7
1	1	2	3	2	3	2	2
2	1	1	2	3	4	2	2
3	1	3		1	5	4	2
4		4		3	4	4	2
5		3		1	4		5 2
6		4		4	3		2
7				5	4		5 2
8				2	4		2
9				3			4
10				1			
11				3			
12				4			
13				1			

Table 6 Summary of the quality scores associated to each Targeted Products according to the expert's evaluations.

In conclusion, the expert assessment is that the monitoring system of the Mediterranean Sea does allow partially to generate "fit for purpose" products for at least six of seven Challenges.
Furthermore, from the analysis of the appropriateness indicators it emerges that the largest negative scores are linked to products that have inadequate **horizontal coverage and resolution** and **temporal validity** (i.e. the last time the input data sets to the product were updated).

3. Monitoring assessment and gap analysis

The main Checkpoint question is:
"is the Mediterranean Sea monitoring system adequate and if not, for what characteristics (or essential marine variables)? "
In order to answer this question we have ordered the availability and the appropriateness scores by characteristics, across all the challenges and products.

The Targeted Products used only 29 different characteristics from 90 input data sets, i.e. approximately 3 data sets per characteristics are used to determine the "fitness for use" of the monitoring system. Statistical validity of the results is somewhat low and thus the project decided to find the key gaps or the most important monitoring inadequacy by selecting the characteristics that scored lowest indicator values (red) for both availability and appropriateness. If statistics will be larger in the future we could most likely use a better combination of the indicator territories.

In synthesis for availability indicators the statistics of the scores and the number of data sets used to determine it is shown in Table 7.

Characteristics (following the nomenclature of SeaDataNet P02 vocabulary)	# of Red scores	# of Yellow scores	# of Green scores	number of data sets
Pollution events	7	1	0	1
Spectral wave data parameters	4	2	2	1
Fish and shellfish catch statistics	3	3	2	10
Horizontal platform movement	3	3	2	8
Wave direction	3	1	4	8
Fishing by-catch	3	3	2	1
Sedimentary structure	3	2	3	1
Marine archaeology	3	3	2	1
Bird reproduction	3	1	4	1
Wave height and period statistics	2	2	4	18
Habitat extent	2	1	5	17
Fauna abundance per unit area of the bed	2	1	5	4
Fish abundance in water bodies	2	1	5	3
Marine environment leisure usage	2	4	2	2

Air pressure	2	5	1	1
Air temperature	2	5	1	1
Atmospheric humidity	2	5	1	1
Fish behaviour	2	1	5	1
Fish reproduction	2	1	5	1

Table 7 Characteristic categories that are inadequate for availability indicators in order of inadequacy

For appropriateness indicators the scores are reported in Table 8.

P02 Characteristics	# of Red scores	# of Yellow scores	# of Green scores	number of data sets
1. Administrative units	4	2	2	12
2. Horizontal platform movement	3	4	1	13
3. Lithology	3	1	4	10
4. River flow and discharge	3	3	2	8
5. Fish and shellfish catch statistics	3	2	2	6
6. Habitat extent	3	2	3	6
7. Coastal geomorphology	3	5	0	3
8. Fish abundance in water bodies	3	3	2	1
9. Wave direction	3	3	2	1
10. Nitrate concentration parameters in the water column	2	3	3	9
11. Dissolved oxygen parameters in the water column	2	3	3	8
12. Phosphate concentration parameters in the water column	2	3	3	6
13. Wave height and period statistics	2	4	2	4
14. Salinity of the water column	2	3	3	4
15. Fishing by-catch	2	4	2	1

Table 8 Characteristic categories that are inadequate for appropriateness indicators in order of inadequacy

We argue that **gaps in the Mediterranean Sea monitoring system are identified by the common inadequate characteristics between the red scored characteristics in the two territories.**

Comparing Table 7 and 8 the characteristics with negative score in both availability and appropriateness indicators, including a targeted product which could not be done, are :

1. **sediment mass balance monitoring data**, the targeted product could not be done, data are only available in the literature and after the last EUROSION project, terminated in 2004, no INSPIRE catalogue and database was constructed from the data collected.

2. **the fishery data, composed of fish and shellfish catch, fish by-catch and fish abundance in the water column.** Many of the indicators are inadequate for both availability and appropriateness. The key **inadequate** quality attributes for this monitoring characteristics are: **visibility, EU INSPIRE catalogue, data policy visibility, readiness, data delivery and data policy, horizontal and temporal coverage, temporal validity**.
3. **the habitat extent** characterization (Posidonia oceanica, Coralligenous and Maerl habitats, seabed sensible habitats) input data sets are also totally inadequate in terms of **Data Policy and Responsiveness, Vertical and horizontal coverage, temporal and horizontal resolution**.
4. **the wave height, period and direction** input data sets are totally **inadequate** because of negative scores for **visibility, INSPIRE Catalogue, Data Policy, Pricing, responsiveness, temporal coverage, horizontal and temporal resolution.**
5. **the Platform movement, i.e. maritime traffic** input data sets are totally **inadequate** because of negative scores for **visibility, INSPIRE Catalogue, responsiveness, horizontal and temporal coverage, temporal validity.**

4. Outlook

The EMODnet Checkpoint concept is an innovative one, developed for the first time in the Mediterranean and North Sea and now adapted and implemented in the other European regional Seas. Synthetically, the Checkpoint tries to show "how monitoring meets the needs of public and private users".
It is based upon the assumption that information about the quality of data is a crucial factor to decide their utilization. Data users deal with situations requiring different levels of data quality: extremely accurate data is required by some users for certain needs and less accurate data are sufficient for other needs. Furthermore, the EMODnet Checkpoint concept starts from the understanding that data of appropriate quality may exist but obstacles to identify and get them may have the same impact as missing data.
Implementing the Checkpoint concept requires a methodology covering all assessment aspects which are:

- ✓ objectivity,
- ✓ quantitative analysis,
- ✓ verifiable analysis.

Thus, the EMODnet MedSea Checkpoint developed a "service" to meet all these requirements based on:

- ✓ INSPIRE principles (2007). Network services are necessary for sharing spatial data between the various levels of public authority in the Community. Those network services should make it possible to **discover, transform, view and download** spatial data and to invoke spatial data and e-commerce services.

- ✓ the use of concepts from EEA Core set of indicators (2005). The purpose of indicators should be: prioritize improvements in the quality and coverage of data flows; enhance comparability and certainty of information and assessments; provide a manageable and stable basis for indicator-based assessments of progress against environmental policy priorities.

The Checkpoint service facilitates access to upstream monitoring data and Challenge targeted products (verifiable analysis). Such service is now implemented in the EMODnet Checkpoint MedSea pages: http://www.emodnet-mediterranean.eu/checkpoint-service/

It is believed that maintenance and upgrade of such service could be of importance because:

1. Checkpoint Service should provide periodic monitoring system **assessments** since
   - The monitoring systems evolve in tiem and every few years there is a need to re-assess;
   - more Challenges are required to enlarge the statistics;
2. Checkpoint could develop **best practice** guidelines for using data to produce Challenge targeted products;
3. Checkpoint could develop **e-training** tools;
4. Checkpoints need to establish **strong & permanent links with intermediate and end users** from industry to public authorities and 'regional' approach is the most appropriate and practically feasible.

The second DAR concluded with the following recommendation:

Recommendation 9: Further develop the monitoring assessment framework developed in the Checkpoints as an authoritative network service to assess periodically the monitoring systems at the six European marine basin scales. Harmonization of methods between sea basin Checkpoints will be required. The continuation of the Checkpoint network will allow to increase the statistical database, achieve credibility in the indicator analysis, upgrade the system with new indicators chosen by end-users.

Potential actions to be undertaken to satisfy such a recommendation are:

Action 6: form a Checkpoint steering committee that will distil the harmonized Checkpoint infrastructure emergening as a service that will go hand-in-hand with the EMODnet Portals and the CMEMS future developments.

Action 7: provide a user consultation Forum for the choice of Challenge products, the requirements from the products and the choice of assessment indicators.

5. Outputs

The Literature survey is published: http://www.emodnet-mediterranean.eu/reports_news/ and https://webgate.ec.europa.eu/maritimeforum/node/3646.

The First DAR is published: http://www.emodnet-mediterranean.eu/reports_news/ and http://www.emodnet.eu/checkpoints/reports.

The Second DAR is published: http://www.emodnet-mediterranean.eu/reports_news/ and http://www.emodnet.eu/checkpoints/reports.

The MedSea Checkpoint Portal is: http://www.emodnet-mediterranean.eu/

The Checkpoint service is: http://www.emodnet-mediterranean.eu/checkpoint-service/

Appendix 1: Targeted Products

Name of Targeted product	Short description	Format
MEDSEA_CH1_Product_1	A wind – wave data set	shapefile
MEDSEA_CH1_Product_2	A suitability index of a wind farm in the NW Mediterranean concerning the environmental resources	shapefile
MEDSEA_CH1_Product_3	A suitability index of a wind farm in the NW Mediterranean concerning the environmental resources, the natural barriers, human activities, MPA and fisheries	shapefile
MEDSEA_CH2_Product_1	Med protection initiatives (management and conservation areas). Collated data set (excel file) containing information on MPA extension areas and different protection levels for each of them	excel files
MEDSEA_CH2_Product_2	Med conservation areas, biological zones, fisheries restricted areas. Shape file with the layers containing the information as in MEDSEA_CH2_Product_1 and depth zones.	shapefile
MEDSEA_CH2_Product_3	Proposed regional conservation areas in the Mediterranean. etc.	shapefile
MEDSEA_CH2_Product_4	Qualitative analysis of connectivity between MPAs. Combination of MPA, temperature, currents seasonal GIS layers	shapefile
MEDSEA_CH2_Product_5	Representativity of habitats/species/other features. Combination of bathymetry, MPA, seagrass distributions, Cetaceans, light, habitats substrate, Natura sites	shapefile
MEDSEA_CH2_Product_6	The monitoring capacity of biodiversity in MPAs. Combination MPA and monitoring stations for biodiversity elements	shapefile

MEDSEA_CH3_Product_1	OPL Bulletin released after a DG MARE request received by email on the 28th of July 2014, containing the notification of two oil leaks: *"The drillship "Magna Belgica" in the wider area of 'Caliph prospect' off the coast of Libya encountered a technical failure. A fire and crude oil leak began immediately. The spill was contained for the duration of 5 hours with total of 50 tons crude oil loss at sea surface. After initial repairs the vessel set sail for inspection in Naples. Reaching the strait of Messina around 06:15 CET this morning, the drillship experienced engine and rudder failure leading to a collision with a cargo ship. The drillship was heavily damaged and lost a total load of 2000 tons of diesel fuel oil by 10:20 CET."*	pdf document
MEDSEA_CH3_Product_2	OPL Bulletin released after the DG MARE alert received by email on the 10th of May 2016 about the following situation: *"In August 2013 an incident occurred during a tanker loading operation at a buoy off the coast of the Sidi Kerir terminal of the Sumed pipeline (LAT: 31,130824; LON: 29,75227) with an estimated rate of 5000m3 Brent crude oil spilled during a period of 24 hours starting 8:15 CET on 13/08/2013. The accident went largely unattended in the aftermath of the 2013 Egyptian Coup d'état during a period of unrest and instability."*	pdf document
MEDSEA_CH4_Product_1	Spatial layer of sea temperature trend at the surface (units: degC/year) from observations (HadISST dataset) over periods of 10 (2003 – 2012) years, 50 years (1963-2012) and 100 years (1913-2012).	shapefile
MEDSEA_CH4_Product_2	Spatial layer of sea temperature trend at mid-depth and at sea-bottom (units: degC/year) from reanalysis (CMEMS Mediterranean Physics Reanalysis dataset) over period of 10 (2003 – 2012) years.	shapefile

MEDSEA_CH4_Product_3	Spatial layer of sea internal energy trend (units: J/m^2*year) from reanalysis (CMEMS Mediterranean Physics Reanalysis dataset) over period of 20 (1993 – 2012) years.	shapefile
MEDSEA_CH4_Product_4	Spatial layer of sea-level trend (units: mm/yr) from CMCC reconstruction over periods of 50 years (1963 – 2012) and 100 years (1913-2012).	shapefile
MEDSEA_CH4_Product_5	Spatial layer of sea-level trend (units: mm/yr) from AVISO reconstruction over period of 10 years (2003 – 2012).	shapefile
MEDSEA_CH4_Product_6	Spatial layer of sea–level trend (units: mm/year) from PSMSL tide-gauges over periods of 50 years (1963-2012) and 100 years (1913-2012).	shapefile
MEDSEA_CH4_Product_7	Report on Sediment Mass Balance at the Coast from Experts Survey and Scientific Literature Review.	pdf
MEDSEA_CH4_Product_8	Time series of annual average sea temperature at the surface (units degC) from observations (HadISST dataset) over periods of 10 (2003 – 2012) years, 50 years (1963-2012) and 100 years (1913-2012).	Image
MEDSEA_CH4_Product_9	Time series of annual average sea temperature at mid-depth and at sea-bottom (units: degC) from reanalysis (CMEMS Mediterranean Physics Reanalysis dataset) over period of 10 (2003 – 2012) years	image
MEDSEA_CH4_Product_10	Time series of annual average sea internal energy (units: J/m^2) from reanalysis (CMEMS Mediterranean Physics Reanalysis dataset) over period of 20 (1993 – 2012) years.	image

MEDSEA_CH4_Product_11	Time series of annual average sea-level (units: mm) from CMCC reconstruction over periods of 50 years (1963 – 2012) and 100 years (1913-2012).	image
MEDSEA_CH4_Product_12	Time series of annual average sea-level (units: mm) from PSMSL time-gauges over periods of 50 years (1963 – 2012) and 100 years (1913-2012).	image
MEDSEA_CH4_Product_13	Time series of annual average sea-level (units: mm) from AVISO satellite altimetry over period of 10 years (2003-2012.	image
MEDSEA_CH5_Product_1	Collated data set of landings by species and year, for mass and number	excel file
MEDSEA_CH5_Product_2	Collated data set of discards by species and year, for mass and number	excel file
MEDSEA_CH5_Product_3	Collated data set of bycatch by species and year, for mass and number	excel file
MEDSEA_CH5_Product_4	Impact of fisheries on the bottom from VMS data combined with seabed substrate and habitat vulnerability	shapefile
MEDSEA_CH5_Product_5	Change level of disturbance from VMS data combined with seabed substrate and habitat vulnerability	shapefile
MEDSEA_CH5_Product_6	Impact of fisheries on the bottom from AIS data combined with habitat vulnerability	shapefile
MEDSEA_CH5_Product_7	Change level of disturbance from AIS data combined with seabed substrate and habitat vulnerability	shapefile
MEDSEA_CH5_Product_8	Impact of fisheries on the bottom from	shapefile

	Data Logger combined with seabed substrate and habitat vulnerability	
MEDSEA_CH6_Product_1	Maps of seasonal Chlorophyll (UNITS: mg/m3) from L4 satellite ocean color data FOR THE PAST 10 YEARS (2005-2014)	shapefile
MEDSEA_CH6_Product_2	Map of Chlorophyll trends (UNITS: mg/m3/year) from L4 satellite ocean color data FOR THE PAST 10 YEARS (2005-2014)	shapefile
MEDSEA_CH6_Product_3	Map of seasonal "eutrophication algorithm/indicator" from in situ data and for the past 10 years.	shapefile
MEDSEA_CH6_Product_4	Map of trends of "eutrophication algorithm/indicator" from in situ data and FOR THE PAST 10 YEARS	shapefile
MEDSEA_CH7_Product_1	Annual time series of Water Discharge (Q_w) [m^3/s] from in situ and model data	excel file
MEDSEA_CH7_Product_2	Monthly time series of Water Discharge (Q_w) [m^3/s] from in situ and model data	excel file
MEDSEA_CH7_Product_3	Annual time series of Total Suspended Matter (TSM) from satellite data [mg/l]	
MEDSEA_CH7_Product_4	Monthly time series of Total Suspended Matter (TSM) from satellite data [mg/l]	excel file
MEDSEA_CH7_Product_5	Annual time series of Total Nitrogen [mg/l] from in situ and model data	excel file
MEDSEA_CH7_Product_6	Monthly time series of Total Nitrogen [mg/l] from model data	excel file
MEDSEA_CH7_Product_7	Annual time series of Total Phosphorous [mg/l] from in situ and model data	excel file

MEDSEA_CH7_Product_8	Monthly time series of Total Phosphorous from model data [mg/l]	excel file
MEDSEA_CH7_Product_9	Annual time series of Eels Production per country [tons]	excel file