


EMODnet
European Marine Observation and Data Network
Your gateway to marine data in Europe


The EMODnet OPEN SEA LAB hackathon

Lessons learned and required actions



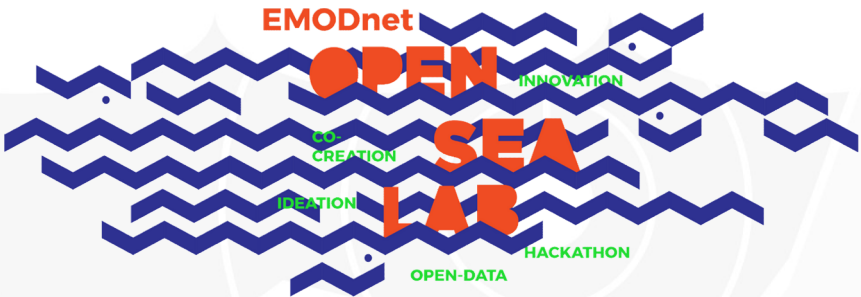
Pascal Derycke | EMODnet Secretariat

The European Marine Observation and Data Network (EMODnet) is financed by the European Union under Regulation (EU) No 509/2014 of the European Parliament and of the Council of 15 May 2014 on the European Maritime and Fisheries Fund.



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European Marine Observation and Data Network


A 3 days hackathon on Open Marine data



EMODnet
OPEN SEA LAB
INNOVATION
CO-CREATION
IDEATION
OPEN-DATA
HACKATHON

15-17 November 2017 De Serre, Antwerp, Belgium



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Promoting EMODnet

EMODnet
European Marine Observation and Data Network

- Are you aware of the vast resource of open European marine data made available by [EMODnet](#) and of its potential?
- EMODnet provides harmonised, transboundary, multidisciplinary marine data.

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Marine Open data

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- From EMODnet**
[EMODnet Bathymetry](#), [EMODnet Geology](#), [EMODnet Chemistry](#), [EMODnet Physics](#), [EMODnet Biology](#), [EMODnet Human Activities](#), [EMODnet Seabed Habitats](#)
- From others**
[Lifewatch Marine](#), [OBIS](#), [Marine Regions](#), [World Register of Marine Species \(Taxonomy\)](#), [Marine Copernicus](#), [European Data Portal](#)

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15 Coaches

	Area of Expertise	Affiliation
Aron-Levi Herregodts	User Experience	imec
Dimitri Schuurman	User Experience	imec
Thomas De Meester	UX design	imec
Joris Finck	Business Modelling	imec
Sara Rachdi	Digital Marketing	Think with People
George Spoelstra	EMODnet Bathymetry	GGs Geo Consultancy
Coralie Monpert	EMODnet Bathymetry	SHOM
Charles Troupin	EMODnet Chemistry & Biology	University of Liège
Matteo Vinci	EMODnet Chemistry	OGS
Graeme Duncan	EMODnet Seabed Habitats	JNCC
Gerrit Hendriksen	EMODnet Chemistry	Deltares
Filip Waumans	EMODnet Biology	VLIZ
Bart Vanhoorne	EMODnet Biology	VLIZ
Marco Alba	EMODnet Physics	ETT
Pascal Derycke	EMODnet	EMODnet Secretariat

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A jury

	Organization	Country
Simon Claus	VLIZ	Belgium
Jan-Bart Calewaert	EMODnet	Belgium
Frédéric Bardolle	Data For Good	France
Mark Bollen	IMDC	Belgium
Mathias Van Compernelle	imec	Belgium
Charlotte Herman	EU Commission	Belgium
Margot Hermans	The Co-Foundry	Belgium
Pieter Colpaert	imec	Belgium
Julliette Rimetz	Technopôle Brest-Iroise	France

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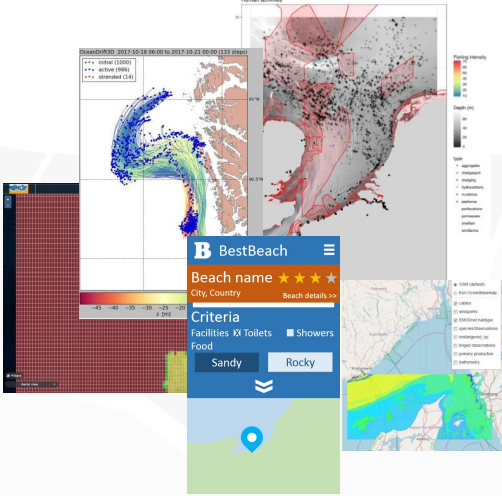
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7 teams with exciting challenges

Tackling the following domains:

- Fisheries
- Energy
- Tourism
- Environment
- Aquaculture

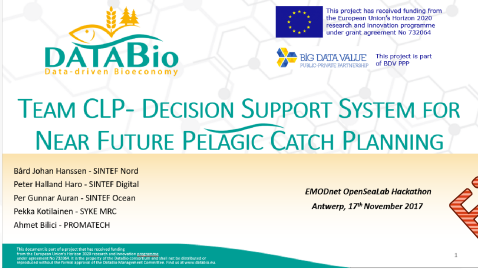


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Team 1 (Counter Logic Programming)

● developed a decision support system for near-future catch planning in the fisheries sector. Where to fish, what and when?



Fisheries

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Team 2 (X)

- presented a decision support tool for the offshore wind energy sector. 'Aggregator' displayed gridded cells to allow users to assess the suitability of a site for establishing wind turbines.



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Team 3 (ImarDis)

- winners of 'Best Pitch'**, produced a tool for scuba divers to identify where to dive for wrecks. Users would be able to identify suitable wreck dive sites based on a range of parameters.



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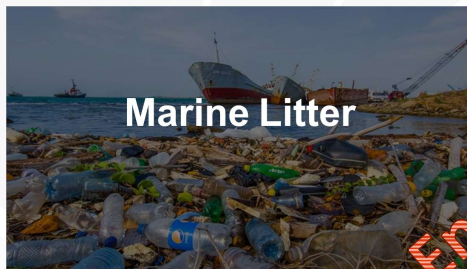


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Team 4 (Marine litter)

- presented their plans to create a marine litter hotspot prediction tool



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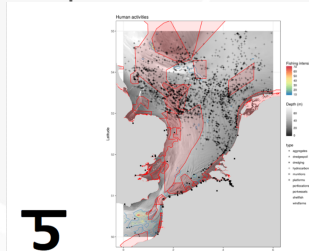


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Team 5

- the **overall winner of 'Best Product'** developed an EU wide tool for identifying suitable areas at sea to farm seaweed. The tool is open source and has potential for adaptation to other sectors.



[Map created based on EMODnet webservices]



Aquaculture

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Team 6 (Deltares)

- demonstrated their 'Environmental Impact Assessment Wizard' to make life easier for environmental project managers, by providing them with rapid access to relevant data at a relevant scale.



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Team 7 (Soledad)

- presented their progress towards a tourism App to identify suitable beaches for tourism activities based on various parameters.



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A close look at the challenge of the awarded team « Seaweed farming »

- ◉ Objective: design of an assessment tool able to identify suitable areas at sea to farm seaweed
- ◉ Method: establishing a decision tree classification scheme by mixing MSP maps and ecological, physical & biological data
- ◉ Output: multivariable clustering
« Where are the suitable areas? »

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Know-how

- ◉ Selection of the datasets
Parsing of a catalogue service (CSW) XML response.
- ◉ Crop, download & modelling with R
« Definition of a bounding box and use of the webservices » (Bathymetry (WCS), Human activities (WFS), Seabed habitats (WMS), Fishing density (R.data))
- ◉ Web user interface & visualisation with R-shinny
Nice but a real-time Web “processing” application can hardly be operational!

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The questionnaire (6/7)


- **Discovering data**
 Was it easy to find the existing data?
 How did you do it?
- **Accessing data**
 How easy was the access to the data?
 Which of the web services did you use to access the data in your project?
- **Processing data**
 What did you do with the data or wanted to do?
- **General evaluation of the challenges?**
 Did you experience any difficulty in finding/accessing/processing the data?

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Discovering data

%

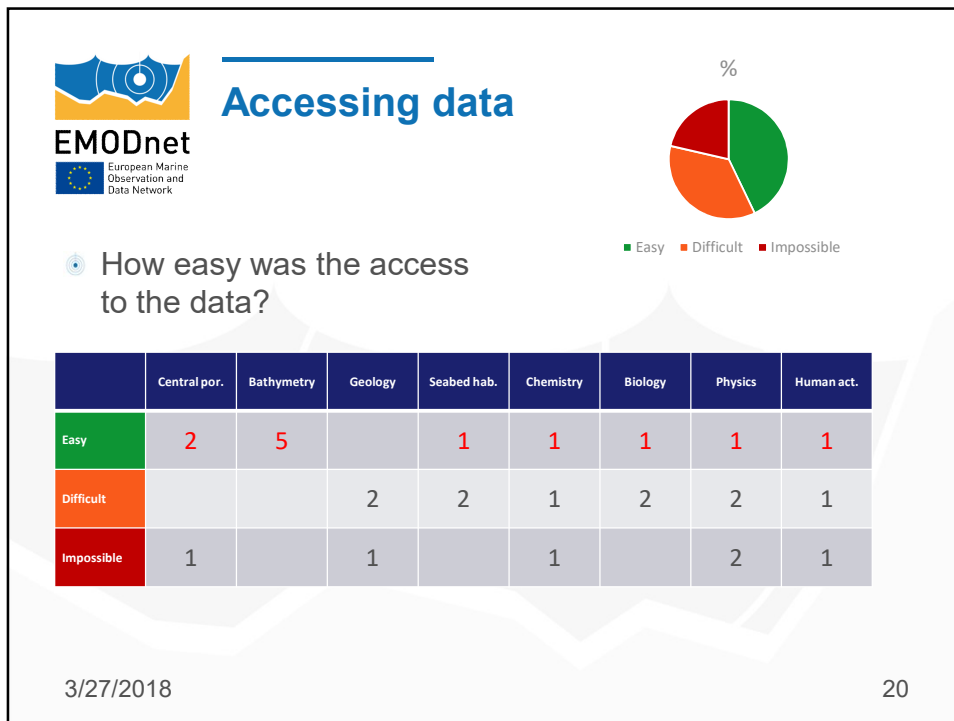
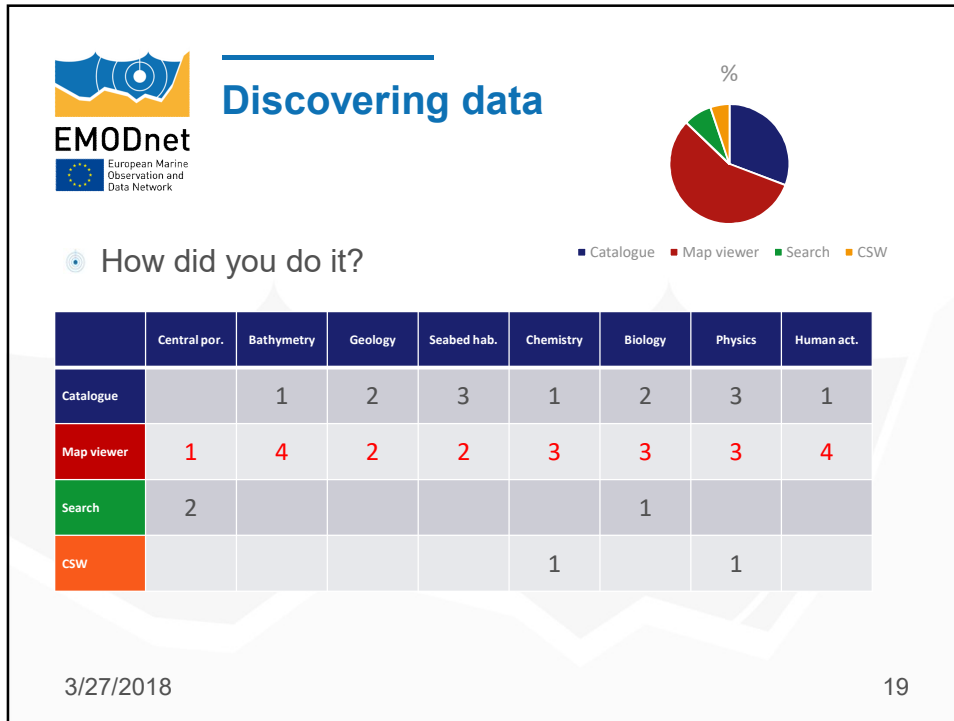


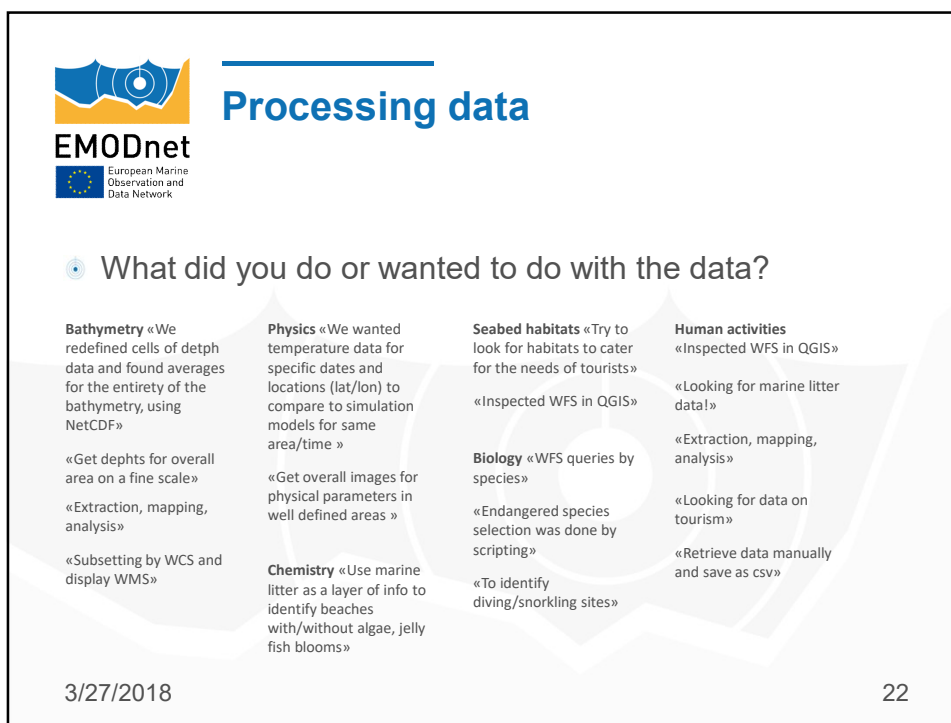
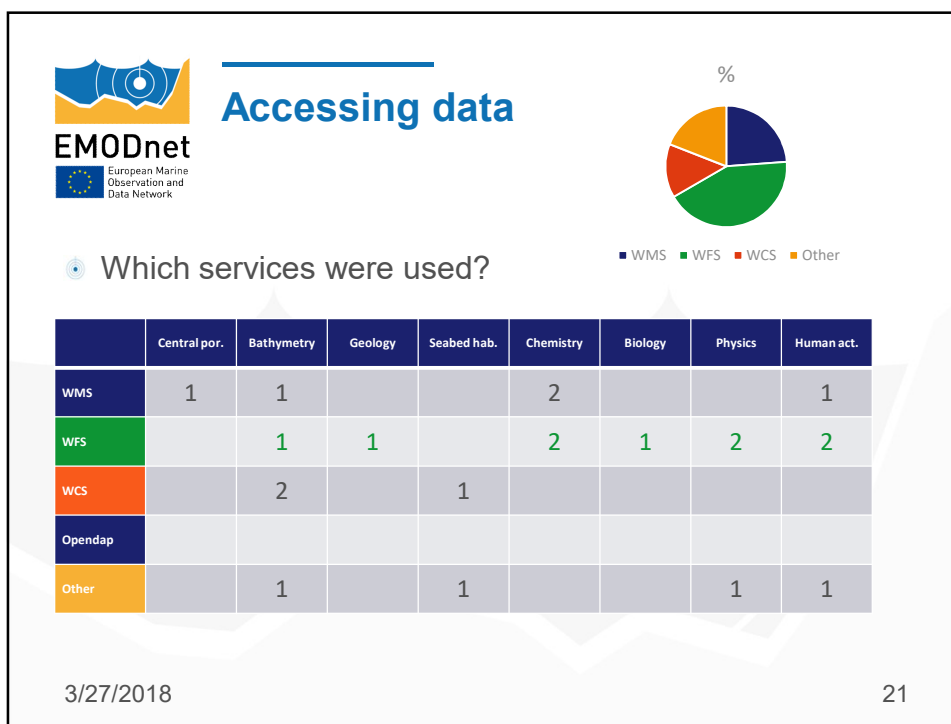
■ Easy
 ■ Difficult
 ■ Impossible


• Was it easy to list the existing data?

	Central por.	Bathymetry	Geology	Seabed hab.	Chemistry	Biology	Physics	Human act.
Easy	3	4	2	1	2	3	2	
Difficult	1	1	2	3	2	2	2	1
Impossible		1					1	1

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General evaluation

Any challenges?

<p>Central portal «Documentation might be useful» «Different approaches to each dataset make it harder to use them all at once» Bathymetry «Aggregated 20GB of NetCDF bathy in 20 minutes»</p>	<p>Physics «problem with data filtering, not supporting standard WFS BBOX/TIME» «Hard/impossible to get data from server. Lots of missing data points» Chemistry «Data comes in csv file that ArcGIS struggles to use due to the formatting»</p>	<p>Seabed habitats «Hard to retrieve data from WMS» «We had difficulties to find and access the data» «We could not subset via OGC services. It was done on QGIS» Geology «No seismic data found»</p>	<p>Human activities «WMS server didn't respond to requests» «It's nice when it works!» «Version 1.0.0 vs 1.1.0 !!!» «Would have been nice to have OGC compliant services» «We had difficulties to find, access and process the data»</p>
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Conclusion

- An appealing shop window (i.e. map viewers) but access to the « store » requires substantial improvements (i.e. Web services) and documentation.

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Action 1: publish a comprehensible documentation

- on the data discovery (« central » documentation)
 - Catalogue service
 - View service
 - Download service
 - & tools for accessing data (APIs)
 - Helpdesk contacts
- a specific documentation for all individual portals on data access and existing APIs.

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INSPIRE metadata record xml file with OnlineResource WWW:LINK

```

- <gmd:distributionInfo>
- <gmd:MD_Distribution>
- <gmd:transferOptions>
- <gmd:MD_DigitalTransferOptions>
- <gmd:online>
- <gmd:CI_OnlineResource>
- <gmd:linkage>
  <gmd:URL>http://emis.jrc.ec.europa.eu</gmd:URL>
- <gmd:linkage>
- <gmd:name>
  <gco:CharacterString>Environmental Marine Information System</gco:CharacterString>
- <gmd:name>
- <gmd:protocol>
  <gco:CharacterString>WWW:LINK</gco:CharacterString>
- <gmd:protocol>
- <gmd:description>
  <gco:CharacterString>
  emis.jrc.ec.europa.eu: The Environmental Marine Information System (EMIS) provides information on marine ecosystems and coastal state, using biological and physical
  variables generated by satellite remote sensing. EMIS allows visualisation and download of Remote Sensing Ocean color data and derived products hosted at the
  Directorate D - Sustainable Resources.
  <gco:CharacterString>
- <gmd:description>
- <gmd:function>
  <gmd:CI_OnlineFunctionCode codeList="http://standards.iso.org/inf/PublicKey/AvailableStandards/ISO_19119_Schemas/resources/codelist
  /ML_gmxCodelists.xml/CI_OnlineFunctionCode" codeListValue="information">information</gmd:CI_OnlineFunctionCode>
- <gmd:function>
- <gmd:CI_OnlineResource>
- <gmd:online>
- <gmd:online>
- <gmd:CI_OnlineResource>
- <gmd:linkage>
  <gmd:URL>
  http://emis.jrc.ec.europa.eu/gis.php?xml_selection=4km
- <gmd:URL>
- <gmd:linkage>
- <gmd:name>

```

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Action 2: further develop an operational machine-to- machine service

- Monitoring the Web services (System downtime and server performance)
- Improve the level of INSPIRE compliancy in order to publish the EMODnet catalogue on the:



EU Open Data Portal
Access to European Union open data

“The **European Union Open Data Portal** (EU ODP) gives you access to open data published by EU institutions and bodies. All the data you can find via this catalogue are free to use and reuse for commercial or non-commercial purposes.”

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Monitoring the Web services Metadata (wms getcapabilities)

Date: 2018-03-18

Chemistry [Metadata] [Server responses] [MetadataUrl]

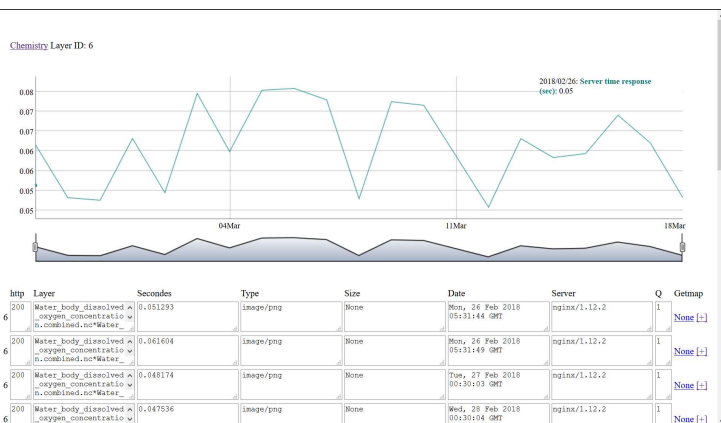
http	Layer	Title	Abstract	Keywords	Proj	Extent	Q	Getmap
0	Water_body_ammonium.co mbined.no*Water_body_a mmonium_L2	Layers	Units: umol/l Methods: spatial interpolation	[]	['CRS:84', 'EPSG:4326', 'EPSG:54004']	-40,24,54.9,66.9	0	None []
1	Water_body_ammonium.co mbined.no*Water_body_a mmonium_L2	Water body ammonium	Units: umol/l Methods: spatial interpolation	[]	['CRS:84', 'EPSG:4326', 'EPSG:54004']	-40,24,54.9,66.9	0	None []
2	Water_body_ammonium.co mbined.no*Water_body_a mmonium_L2	Water body ammonium masked using relative error threshold 0.5	Units: umol/l Methods: spatial interpolation	[]	['CRS:84', 'EPSG:4326', 'EPSG:54004']	-40,24,54.9,66.9	1	None []
3	Water_body_chlorophyll _a.combined.no*Water_b ody_chlorophyll_a_L2	Water body chlorophyll-a	Units: mg/m ³ Methods: spatial interpolation	[]	['CRS:84', 'EPSG:4326', 'EPSG:54004']	-40,24,54.9,66.9	0	None []
4	Water_body_chlorophyll _a.combined.no*Water_b ody_chlorophyll_a_L2	Water body chlorophyll-a masked u sing relative error	Units: mg/m ³ Methods: spatial interpolation	[]	['CRS:84', 'EPSG:4326', 'EPSG:54004']	-40,24,54.9,66.9	1	None []
5	Water_body_dissolved_o xygen_concentratio n.combined.no*Water	Water body dissolved oxygen concentration	Units: umol/l Methods: spatial interpolation	[]	['CRS:84', 'EPSG:4326', 'EPSG:54004']	-40,24,54.9,66.9	0	None []
6	Water_body_dissolved_o xygen_concentratio n.combined.no*Water	Water body dissolved oxygen concentration masked using	Units: umol/l Methods: spatial interpolation	[]	['CRS:84', 'EPSG:4326', 'EPSG:54004']	-40,24,54.9,66.9	1	None []
7	Water_body_phosphate.c ombined.no*Water_body _phosphate_L2	Water body phosphate	Units: umol/l Methods: spatial interpolation	[]	['CRS:84', 'EPSG:4326', 'EPSG:54004']	-40,24,54.9,66.9	0	None []
8	Water_body_phosphate.c ombined.no*Water_body _phosphate_L2	Water body phosphate masked using relative error threshold 0.5	Units: umol/l Methods: spatial interpolation	[]	['CRS:84', 'EPSG:4326', 'EPSG:54004']	-40,24,54.9,66.9	1	None []
9	Water_body_silicate.co mbined.no*Water_body_s ilicate_L2	Water body silicate	Units: umol/l Methods: spatial interpolation	[]	['CRS:84', 'EPSG:4326', 'EPSG:54004']	-40,24,54.9,66.9	0	None []
10	Water_body_silicate.co mbined.no*Water_body_s ilicate_L2	Water body silicate	Units: umol/l	[]	['CRS:84',	-40,24,54.9,66.9	1	None []

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Server performance



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MetadataURL

Chemistry [Metadata] [Server response][MetadataURL]

http	Layer	Title	OnlineResource	Type	Format	Legend	Q	Getmap
200	Water_body_ammonium_combined.no*Water_body_ammonium_L2	Layers	http://sestant.ifremer.fr/geonetwork/srv/eng	TC211	text/html		0	None [v]
200	Water_body_ammonium_combined.no*Water_body_ammonium_L2	Water body ammonium	http://sestant.ifremer.fr/geonetwork/srv/eng	TC211	text/html		0	None [v]
200	Water_body_ammonium_combined.no*Water_body_ammonium_L2	Water body ammonium masked using relative error threshold 0.5	http://sestant.ifremer.fr/geonetwork/srv/eng	TC211	text/html		1	None [v]
200	Water_body_chlorophyll_a_combined.no*Water_body_chlorophyll_a_L2	Water body chlorophyll-a	http://sestant.ifremer.fr/geonetwork/srv/eng	TC211	text/html		0	None [v]
200	Water_body_chlorophyll_a_combined.no*Water_body_chlorophyll_a_L2	Water body chlorophyll-a masked using relative error	http://sestant.ifremer.fr/geonetwork/srv/eng	TC211	text/html		1	None [v]
200	Water_body_dissolved_oxygen_concentration_combined.no*Water...	Water body dissolved oxygen concentration	http://sestant.ifremer.fr/geonetwork/srv/eng	TC211	text/html		0	None [v]
200	Water_body_dissolved_oxygen_concentration_combined.no*Water...	Water body dissolved oxygen concentration masked using relative error threshold 0.5	http://sestant.ifremer.fr/geonetwork/srv/eng	TC211	text/html		1	None [v]
200	Water_body_phosphate_combined.no*Water_body_phosphate_L2	Water body phosphate	http://sestant.ifremer.fr/geonetwork/srv/eng	TC211	text/html		0	None [v]
200	Water_body_phosphate_combined.no*Water_body_phosphate_L2	Water body phosphate masked using relative error threshold 0.5	http://sestant.ifremer.fr/geonetwork/srv/eng	TC211	text/html		1	None [v]
200	Water_body_silicate_combined.no*Water_body_silicate_L2	Water body silicate	http://sestant.ifremer.fr/geonetwork/srv/eng	TC211	text/html		0	None [v]
200	Water_body_silicate_combined.no*Water_body_silicate_L2	Water body silicate	http://sestant.ifremer.fr/geonetwork/srv/eng	TC211	text/html		1	None [v]

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Geoportals
«European Atlas of the Seas,...»

Catalogue services
«EU Open data portal,...»

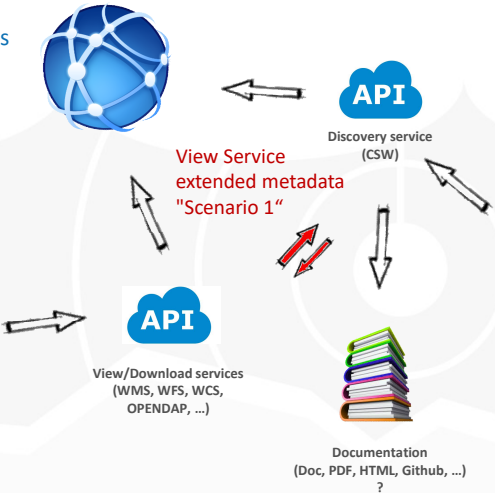


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Spatial datasets
« NetCDF, postGIS, shapefiles, GeoTiff, Geojson, csv, ... »



Machine-to-machine communication




View Service extended metadata "Scenario 1"

Discovery service (CSW)

View/Download services (WMS, WFS, WCS, OPENDAP, ...)

Documentation (Doc, PDF, HTML, Github, ...)




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INSPIRE metadata record

- « Organisation/publisher
- Point of contact
- Title
- Description
- Contributors
- How to cite/licence
- Keywords
- Related resources (data access : download, visualisations WMS, WFS, WCS, **documentation...**)
- Additional information (last modified, Issue/release date, landing page, temporal coverage, language, data theme(s), EuroVoc domain(s), EuroVoc concept(s), Identifier/URI)
- Geographic information (Lineage, Geographic bounding box, Coordinate Ref system) »

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WMS GetCapabilities with MetadataURL

```

<EX_GeographicBoundingBox>
<BoundingBox CRS="EPSG:4326" minx="10" miny="-30" maxx="70" maxy="42"/>
<Identifier authority="EMIS">satellite/4km/EMIS_A_CHLA_MM_YYYY</Identifier>
<MetadataURL type="TC211">
<Format>text/xml</Format>
<OnlineResource xlink:type="simple" xlink:href="http://emis.jrc.ec.europa.eu/satellite/4km/EMIS_A_CHLA.xml"/>
</MetadataURL>
<DataURL>
<Format>text/html</Format>
<OnlineResource xlink:type="simple" xlink:href="http://emis.jrc.ec.europa.eu/emis/satellite/4km/">
</DataURL>
<Style>
<Name>default</Name>
<Title>default</Title>
<LegendURL width="95" height="2053">
<Format>image/png</Format>
<OnlineResource xlink:type="simple" xlink:href="http://emis.jrc.ec.europa.eu/cgi-bin/mapserv?map=/srv/www/htdocs/wms_4km_modisa-chla.map&language=eng&version=1.3.0&service=WMS&request=GetLegendGraphic&id_version=1.1.0&layer=EMIS_A_CHLA_10_2002&format=image/png&STYLE=default"/>
</LegendURL>
<Style>
</Style>
<Layer>
<LayerQueryable="1" opaque="0" cascaded="0">
<Name>EMIS_A_CHLA_11_2002</Name>
<Title>Chlorophyll Concentration (MODIS-A) 11 2002</Title>
<Abstract>log10 mg.m</Abstract>
<KeywordList>
<Keyword>no-keyword here</Keyword>
</KeywordList>
</Layer>
</EX_GeographicBoundingBox>
<westBoundLongitude>-30</westBoundLongitude>
<eastBoundLongitude>42</eastBoundLongitude>
<southBoundLatitude>10</southBoundLatitude>
<northBoundLatitude>70</northBoundLatitude>
</EX_GeographicBoundingBox>
<BoundingBox CRS="EPSG:4326" minx="10" miny="-30" maxx="70" maxy="42"/>

```

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Missing MetadataUrl tag in xml wms getcapabilities response

	Bathymetry	Geology	Seabed hab.	Chemistry	Biology	Physics	Human act.	Geology Ispra	Geology GTK	Geology GDN	Geology DCENR	Geology BGR
Metadata Url	no	y/n	no	yes	y/n	no	no	yes	no	no	no	yes
SERVER	Geoserver nginx/1.12.2	Geoserver Apache 2.4.9 (Win64) OpenSSL 1.0.1g	Mapserver 6.0.1/ Microsoft- IIS/7.0	Mapserver ? Nginx 1.12.2	Geoserver / Apache- Coyote/1. 1	Geoserver Apache- Coyote/1:1	Geoserver Microsoft-IIS/8.5	Mapserver 7.0.4 GlassFish Server Open Source Edition 4.1.2	ArcGIS Microsof t-IIS 8.0	ArcGIS	ArcGIS Matrix Integrator 1.2	ArcGIS Microsoft-IIS 10.0
INSPIRE		INSPIRE extension? metadataU rl + dataurl						<inspire_vs: ExtendedCapabilities>				For INSPIRE <inspire_vs: ExtendedCapabilities>
CSW		egdi.geolog y.cz/csw/		sextant.lfr emer.fr	VUZ geonetwo rk			egdi.geology.cz/csw/ data.geus.dk/egdi/ get_metadata.jsp?				produktcenter.lgr.de/ soapServices/...

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Geoserver INSPIRE Extension


- The INSPIRE extension allows GeoServer to be compliant with the View Service and Download Service specifications put forth by the **Infrastructure for Spatial Information in the European Community (INSPIRE)** directive.
- In practice, this means adding some extra elements into an extended capabilities section of the WMS, WFS and WCS capabilities documents. For WMS, WFS and WCS this includes a **Metadata URL** element with a link to the metadata associated with the service.
- Note: the current INSPIRE extension fulfills "Scenario 1" of the View Service extended metadata requirements. "Scenario 2" is not currently supported in GeoServer.

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Our challenges as EMODnet partners



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VLIZ Geonetwork

Status	Name	Type	URL	Filter
running	Bathymetry	CSW	http://sextant.lifremer.fr/geonetwork	c7b53704-9994-4721-b1a3-04ec60c87238
running	Biology	WMS	http://geo.vliz.be/geoserver/Emodnet/wms	
running	Biology OOPS	WMS	http://geo.vliz.be/geoserver/Emodnetbio/wms	
running	Chemistry	CSW	http://sextant.lifremer.fr/geonetwork/srv/eng/csw-EMODNET_Chemistry?SERVICE=Csw&VERSION=2.0.2&REQUEST=GetCapabilities	
running	Geology	WMS	http://drive.emodnet-geology.eu/geoserver/EMODnetGeology/wms?service=WMS&version=1.3.0&request=GetCapabilities	
running	Geology	WMS	https://secure.dcenr.gov.ie/arcgis/services/EMODNET/EMODnet_Geology_WP7_Minerals/MapServer/WmsServer	
running	Physics	CSW	http://sextant.lifremer.fr/geonetwork/srv/eng/csw-EMODNET_Physics	
running	Seabed Habitats	CSW	http://geo.ices.dk/geonetwork	5d4696dc-bac4-4dd4-82c5-258700553cb4
running	Seabed Habitats	CSW	http://geo.ices.dk/geonetwork	90454091-2136-4cb0-a14b-d5df09a310e0
running	Seabed Habitats	CSW	http://geo.ices.dk/geonetwork	2793db6c-4b93-449a-a67b-0abb4533080e
running	MarineRegions	WMS	http://geo.vliz.be/geoserver/MarineRegions/wms	
paused	Aquamaps	WMS	http://geoserver.dscience-ii.research-infrastructures.eu/geoserver/wms	
paused	Chemistry	WMS	http://ec.oceanbrowser.net/emodnet/python/web/wms?request=GetCapabilities	
paused	Chemistry	WMS	http://pgher-diva.phys.uva.ac.be/emodnet/python/web/wms	
paused	Geology	CSW	http://drive.emodnet-geology.eu/geonetwork/srv/eng/csw	
paused	Geology	WMS	https://secure.dcenr.gov.ie/arcgis/services/EMODNET/EMODnet_Geology_WP7_Minerals/MapServer/WmsServer	
paused	Geology	OWS	http://emodnet-geology.eu/cgi-bin/BGS_ISPRA_EMODNET_Geology/ows	
paused	Human Activities	WFS	http://77.246.172.208/geoserver/emodnet/wfs	

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