



REPORT ON DATA AND CARTOGRAPHIC TOOLS

Abstract

The data theme crosses all the other thematic of Maremed project in order to foster a proactive role of the regions towards the EU maritime policies and in the data management field and to get involved in the European Spatial Data Infrastructure¹. To collect, maintain, update data in a geographic information system is one of the key issues in order to have an integrated maritime vision and to establish efficient policies; the questionnaire on data and cartographic tools is a part of first work phase named "Diagnostic Phase" of the project and is aimed to understand better the problems and the different situations of the partnership regions, to have a preliminary inventory of the available geodata and to know the state of the art of the implementation of the Directive INSPIRE.

Although all the MAREMED regions manage geographic data the situations are very different depending on the administrative national organisation.

More integration and an easier access to the data concerning maritime policies is needed.

Concerning data harmonisation and interoperability, the deepening of the survey on some datasets commonly in use was useful for highlight problems and the need of the development of the INSPIRE specifications, especially in the Sea Regions theme

PART I RESULTS OF THE QUESTIONNAIRE

Introduction

A questionnaire on data and cartographic tools was developed by the PACA and Liguria Regions and was submitted by e-mail to the 14 MAREMED partners (except CRPM for whom is obviously not applicable) in the end of September 2011. Eleven responses have been received from the following partners, highlighted in the map

¹: "National mapping agencies have played an important role in SDI development, but, whereas in the past the word "National" usually preceded the phrase "Spatial Data Infrastructure," that is no longer the case. Government officials recognize that national spatial data infrastructures are made up of many local and subnational spatial data infrastructures. With a broad commitment to interoperability through open standards, an investment within one jurisdiction becomes an investment that serves all related jurisdictions. Different kinds of data are best maintained at different levels of government. With open standards, such distributed responsibility works well, enabling government data sharing partners and private sector stakeholders to easily access the most up-to-date data." http://www.opengeospatial.org/domain/gov_and_sdi

below: Murcia, Feports, Crete, Cyprus, Corse, Emilia Romagna, Liguria, Latium, Tuscany, Paca, Marche.

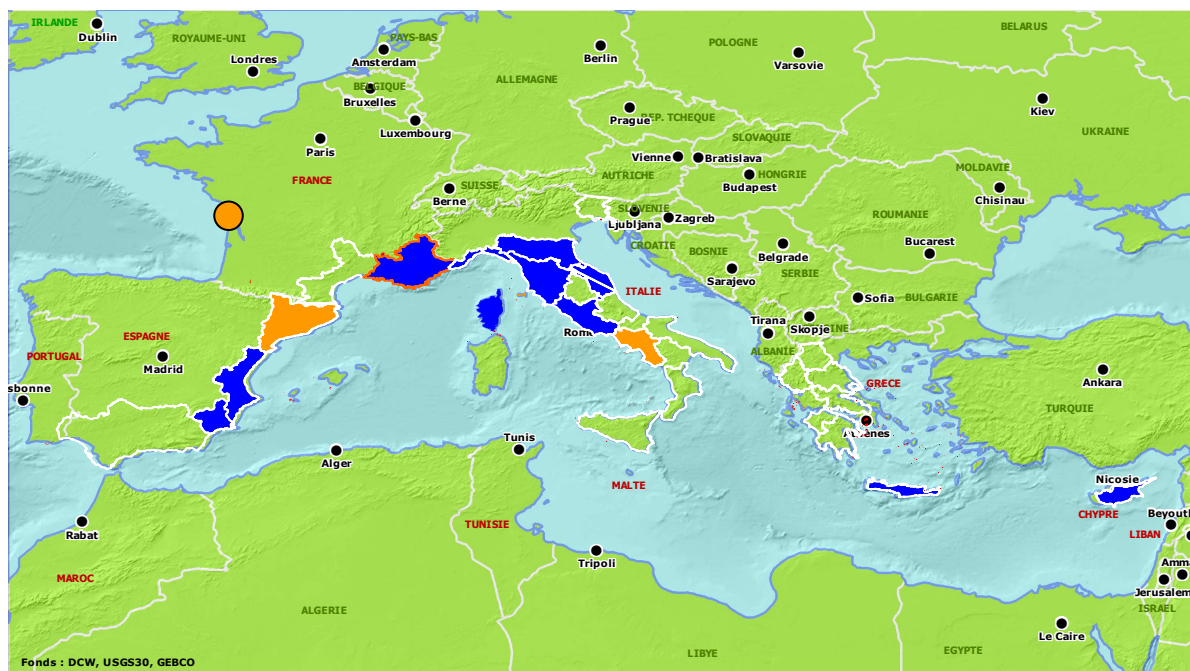


Fig.1 - In blue the MAREMED partners participating to the activity on data and cartographic tools

The questionnaire form and the detailed analysis of the partners' answers are included in Annex I.

By February 2012 information was collected from partners, and we started analysis and test over the information received.

Questionnaire sections

Section 1 - Organization

Most of the partners have a Data Management Infrastructure available for the coastal management. The organisation in charge for the data management can be internal or external, at regional (PACA) or national (Crete) level, supported by internal services.

Partner	External organization	Internal organization
Corse		X
Murcia	X - IMIDA	X – IDERM
Crete	X	X – DAC gathers and validates regional data
Cyprus	X Oceanography Centre (partly)	
Lazio		X -coastal zone observatory
Liguria	X- Datasiel (regional society for informatics)	X
Marche	---	---
Tuscany	X - LAMMA and ARPAT (regional agency)	X
RER		X
PACA	X- CRIGE	X

Only some Italian regions (Emilia Romagna, Lazio, Liguria and Toscana) have an office specially dedicated to the global management of regional data. As expected while dealing with maritime topics, usually the data management is shared among different administrations and levels, as in the case of Valencia Region, showed in the figure below:

Fig.2 – The data management organisation in Valencia Region

This set of questions aimed to know in the detail the data management for the MAREMED themes.

Generally there is no coordination among the different offices in charge of the data production and management in order to achieve an integrated organisation for the data focused on the coastal zone.

Also the data quality and typology should be improved with special reference to the socio economic data of the coastal zone.

a)Fishing

70% of partnership (all except Murcia, Crete and Lazio) manage fishing data in organized way but using different criteria and attributing the competence to different departments; moreover, fishing data are scarcely related to the regional global datasets and therefore cannot contribute to have a complete integrated vision.

Data sets used mainly are: seabed biocenosis, marine protected areas, aquaculture, artificial reefs, fishing fleet, dedicated moorings in the ports.

In some cases data available are only statistical and not spatial, as for Murcia, related to catch volume, number of fishing boats and number of employees.

b)Adapting to Climate Change

Most of the partners manage data regarding climate change adaptation.

Data on coastline evolution and coastal defence works as well as flooding risks and landslide risk maps are the mostly used.

This data or some of them are related to the regional global data set to complete an integrated vision

Only Corse, Liguria and Lazio Regions have a specialised Climate Change Office

Feports has at regional level a specific tool – the Valencian Plan for Managing Flood Risks – and can access to information about river and coastal floods, flooding zones due to extreme weather storms; the Regional Department of Infrastructures of Valencia is managing this kind of information since 8-10 years. The State Institution named Cedex deals with coastal erosion issues.

The “Bureau de Recherches Géologiques et Minières - BRGM” developed a study for the Corse Region about erosion and storms.

Toscana Region did some research in collaboration with ICRAM (now ISPRA) about the flooding risk in case of sea level rise in Versilia alluvial plain.

In some cases the partners made surveys on erosion and extreme events in the framework of EU funded projects like Beachmed-e and Coastance when data were collected for specific pilot sites

c) ICZM

Even though most of the regions don't have a specialised ICZM office with a spatial data service, the regional repertory can be accessed to look for informations useful in managing coastal issues in an integrated way, as in Emilia Romagna, Liguria, Valencia.

It's worth knowing that datasets considered related to ICZM are, for each partner, very different as well as the way to consider the topic.

Some have the tendency to assimilate ICZM mostly to the erosion and flooding problems; others to the territorial and urban planning, others to the water quality management. In some way this result corresponds to the uncertainty in the implementation of the ICZM in the coastal areas.

d) Water Framework Directive

Most of the regions have a data management for the parameters analysed for Water Framework Directive, even though there are not specialised WFD offices at regional level. Sometime, as for Emilia Romagna, this set of data is usually not linked to other databases concerning sea and coast but is available and compatible for integrated analysis, if requested.

e) Oil spill pollution

Only Crete, at national level through the “Ministry of Maritime Affairs”, and Cyprus through the “Cyprus Oceanography Center” have a data management for planning the fighting against pollution.

Nevertheless at regional level there are cases that could be related to the regional global dataset (e.g., Emilia – Romagna agency for environment protection has Climate and Meteorological Unit called Arpa-Simc that in case of warning carries out a simulation of the outflow of the polluting elements through an oil spill model, Murcia has developed a scheme for maritime accidental pollution in ports within the project MARPOL, Lazio has data about vulnerable marine areas, etc).

Generally, the scarcity of answers could be a signal of the lack of involvement of regions in the oil spill fighting.

Section 2 – Budget

Funds from regional ERDF or ERDF from European projects are a real support for regional activities in data acquisition. Instead, there is a lack of national contributions. Data management has a dedicated budget just in some Italian and French regions.

A continuity in the funds availability is needed in order to establish regional coastal observatories (that can collect and distribute data), to make accessible existing data in digital forms (as for the bathymetry, shoreline, erosion rates), to develop metadata and services (as WMS and WFS). For the next financial period the European contribution for coastal and marine data should consider the trustfully regional role in acquisition, validation and maintenance of very large range of data.

Section 3 - Hardware and software

Section 4 – Data management regarding INSPIRE DIRECTIVE :

These sections were developed in the second phase after the return of the questionnaire (see part II).

Section 5 – Juridical Status of data – Dissemination

Almost all the partners are owner of data that they are managing and the majority of them are implementing an open data policy.

Greece in 2010 approved a law for the implementation of the INSPIRE Directive which provide for open data policy and for a web service offering open geospatial data and interactive maps.

Geoportals to open the possibility to pick up the data are available in Emilia Romagna, Lazio, Murcia, Corse and Liguria, mostly for internal needs.

Data exchanges to and from State and region are not very developed, at least for coastal and marine information.

Section 6 – Training of functionaries in charge of data management and/or coastal management

Training for functionaries is pretty poor and often self-study generated. There is also the need to disseminate the information about what already exist in terms of data accessible to the local communities functionaries.

Section 7 – Works with your neighbours

Some partners had experience and worked with neighbours regions in order to do cartographies or mapping (as Pava and Liguria, that worked on a common cartography in the framework of the *Ramoge* agreement; Corse that worked with Sardinia on a project of international cooperation called P.M.I.B.B. (*Parco Marino Internazionale delle Bocche di Bonifacio*; Tuscany with Liguria and Lazio on coastal maps).

Cyprus worked with the Cyprus Oceanography Center for oil spill pollution and with some Mediterranean Countries and *Rempec* (Regional Marine Pollution Emergency Response Centre) under different related program in particular with Israel, Syria and Mediterranean countries..

There were no specific experience of collaboration for coastal management purposes.

Section 8 – Preparing pilot actions component

Awareness raising about Directive Participation to test of Emodnet Interoperability test

These sections were developed in the second phase after the return of the questionnaire (see II part)

PART II INSPIRE IMPLEMENTATION

Introduction

One goal of the data and cartographic tools group is to verify the status of application the INSPIRE Directive with regard to the web services, in order to verify the possibility of use of the SDI from the partners on selected data thematic.

Obviously implementing a Spatial Data Infrastructure, following the INSPIRE Directive, implies that local geonodes must be developed, spatial data must be standardized and harmonization must take place in order to start sharing data.

It seems useful to clarify some of the terms used, and this may be useful to refer to the definitions proposed by the 7FP project *Pegaso*.

“A Spatial Data Infrastructure is a group of technologies, politics, standards, services and human resources, necessities for the compilation, manipulation, access, distribution and use of geographic data in different levels.”

A Spatial Data Infrastructure is based on Geonode and Geoportal for each partner.

Each geonode requires at least:

- data set
- set of services of publishing (WMS, WFS, WCS,...).

Each geoportal requires at least:

- a metadata catalogue

and optionally a viewer of own data publishing and for accessing to other geodata. The SDI should provide a geoportal to allow access to view the data on the basis of catalogue metadata of the services provided by partner. To build an SDI also requires that data sets are standardized and harmonized.

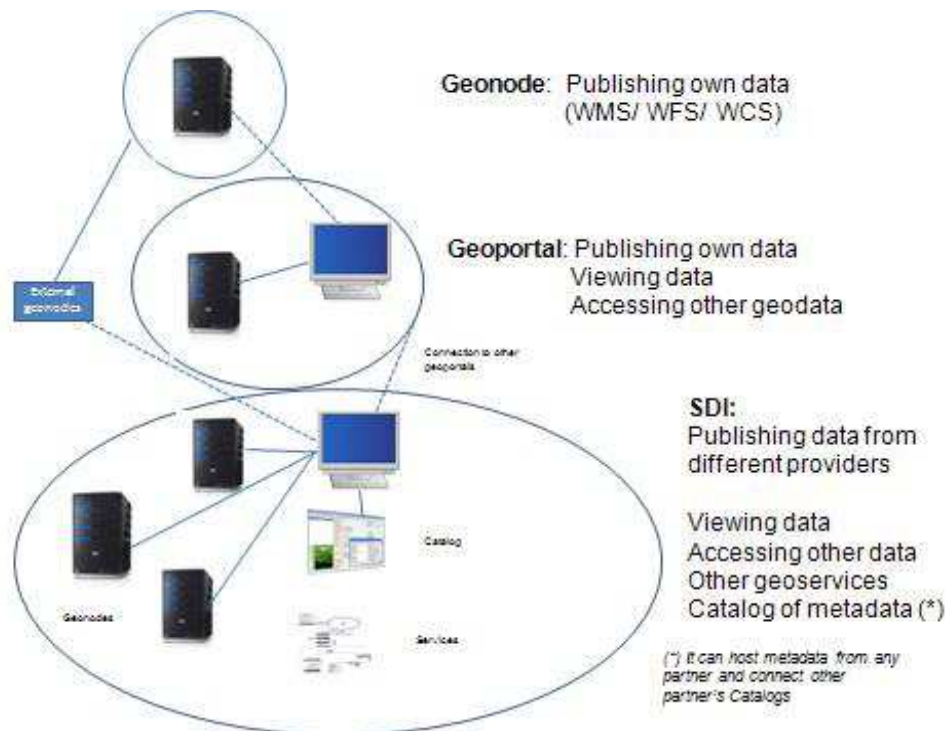


Fig.3. -The diagram of components of SDI (<http://www.pegasoproject.eu>)

In accordance with the definitions and the terms highlighted above was our intention to test among the partners the status of implementation of technological steps described.

To do this, on the second phase, a more detailed questionnaire has been defined and sent to the partners for testing also the possibility of harmonization and interoperability of a certain number of our data layers.

We selected three datasets, for two of which have already been issued the INSPIRE data specifications:

- **Administrative units (municipalities)**

- **Nature 2000 (SIC/ZPS)**

and one-third of specific interest in the problems of integrated management of the coastal zone:

- **Shoreline (current and historical)**

For each spatial data level we asked our partners to fill a form in order to collect information about the following points:

- Native data format;
- Spatial Reference System;
- Nomenclature, terminology used;
- Metadata Model (ISO/TC211 - ISO19139) URL;

- Scale;
- Extension (spatial, temporal and thematic);
- Procedures for data acquisition;
- Structure of the database (name of spatial level, column names, column types, column length)
- Display mode (legend, classification, style);
- OGC web services (WMS,...) URL;

An example of this form filled for the administrative units dataset of the Liguria region is:

Administrative units

Field	Value																																																												
Native data format	Oracle spatial DGN - Bentley DWG - Autocad DXF - ASCII Interchange format GEOMEDIA MSACCESS MAPINFO - Structured (.TAB, .DAT, .ID, .MAP) MGE - Intergraph SHAPE - ArcView SID - Raster Compressed MrSID																																																												
Spatial Reference System - EPSG – CODE	GAUSS BOAGA - MERCATORE TRASVERSO CONFORME DI GAUSS Ellipsoid - Datum: INTERNATIONAL (HAYFORD) - ROMA40 FUSE WEST EPSG - CODE: 3003																																																												
Nomenclature, terminology used	Administrative units, municipalities, provinces, region																																																												
Metadata Model (ISO/TC211 - ISO19139) URL	http://www.cartografiar.liguria.it/RepINSPIRE/tmp/r_liguri.D.56.2011-11-14.html																																																												
Scale	1:5000																																																												
Extension (spatial, temporal and thematic)	Entire regional territory, year 2003, without thematic																																																												
Procedures for data acquisition	Extract of boundaries from the regional technical map 1:5000, integrated by tracing the limits of the municipal cadastral maps at scale 1:5000 and with acquisition of the shoreline from ortophoto IT2000																																																												
Structure of the database (name of spatial level, column names, column types, column lenght)	Table name: COMUNI_5000 Columns name - columns type: <table><tr><th>Name</th><th>Null</th><th>Type</th></tr><tr><td>-----</td><td>-----</td><td>-----</td></tr><tr><td>COD_PROV</td><td></td><td>VARCHAR2(3)</td></tr><tr><td>COD_COM</td><td></td><td>VARCHAR2(3)</td></tr><tr><td>CODICE_COMUNE</td><td></td><td>VARCHAR2(6)</td></tr><tr><td>NOME_PROVINCIA</td><td></td><td>VARCHAR2(50)</td></tr><tr><td>NOME_COMUNE</td><td></td><td>VARCHAR2(40)</td></tr><tr><td>COD_COM_MONTANA</td><td></td><td>VARCHAR2(3)</td></tr><tr><td>COM_MONTANA</td><td></td><td>VARCHAR2(140)</td></tr><tr><td>COD_CONS_COMUNI</td><td></td><td>VARCHAR2(3)</td></tr><tr><td>CONS_COMUNI</td><td></td><td>VARCHAR2(140)</td></tr><tr><td>ID_COMUNE_SISMICO</td><td></td><td>NUMBER(5)</td></tr><tr><td>SISMICO</td><td></td><td>VARCHAR2(2)</td></tr><tr><td>DESCR_SISMICO</td><td></td><td>VARCHAR2(50)</td></tr><tr><td>EX_OB2_DOCUP_97_99</td><td></td><td>VARCHAR2(1)</td></tr><tr><td>AMBITO_EDILIZIA</td><td></td><td>VARCHAR2(1)</td></tr><tr><td>Z_SV_DLGS_146_97_M</td><td></td><td>VARCHAR2(5)</td></tr><tr><td>DESCR_ZONE_SV_P_M</td><td></td><td>VARCHAR2(100)</td></tr><tr><td>DESCR_ZONE_SV_P_R</td><td></td><td>VARCHAR2(100)</td></tr><tr><td>A SV EX CEE 268 75</td><td></td><td>VARCHAR2(1)</td></tr></table>	Name	Null	Type	-----	-----	-----	COD_PROV		VARCHAR2(3)	COD_COM		VARCHAR2(3)	CODICE_COMUNE		VARCHAR2(6)	NOME_PROVINCIA		VARCHAR2(50)	NOME_COMUNE		VARCHAR2(40)	COD_COM_MONTANA		VARCHAR2(3)	COM_MONTANA		VARCHAR2(140)	COD_CONS_COMUNI		VARCHAR2(3)	CONS_COMUNI		VARCHAR2(140)	ID_COMUNE_SISMICO		NUMBER(5)	SISMICO		VARCHAR2(2)	DESCR_SISMICO		VARCHAR2(50)	EX_OB2_DOCUP_97_99		VARCHAR2(1)	AMBITO_EDILIZIA		VARCHAR2(1)	Z_SV_DLGS_146_97_M		VARCHAR2(5)	DESCR_ZONE_SV_P_M		VARCHAR2(100)	DESCR_ZONE_SV_P_R		VARCHAR2(100)	A SV EX CEE 268 75		VARCHAR2(1)
Name	Null	Type																																																											
-----	-----	-----																																																											
COD_PROV		VARCHAR2(3)																																																											
COD_COM		VARCHAR2(3)																																																											
CODICE_COMUNE		VARCHAR2(6)																																																											
NOME_PROVINCIA		VARCHAR2(50)																																																											
NOME_COMUNE		VARCHAR2(40)																																																											
COD_COM_MONTANA		VARCHAR2(3)																																																											
COM_MONTANA		VARCHAR2(140)																																																											
COD_CONS_COMUNI		VARCHAR2(3)																																																											
CONS_COMUNI		VARCHAR2(140)																																																											
ID_COMUNE_SISMICO		NUMBER(5)																																																											
SISMICO		VARCHAR2(2)																																																											
DESCR_SISMICO		VARCHAR2(50)																																																											
EX_OB2_DOCUP_97_99		VARCHAR2(1)																																																											
AMBITO_EDILIZIA		VARCHAR2(1)																																																											
Z_SV_DLGS_146_97_M		VARCHAR2(5)																																																											
DESCR_ZONE_SV_P_M		VARCHAR2(100)																																																											
DESCR_ZONE_SV_P_R		VARCHAR2(100)																																																											
A SV EX CEE 268 75		VARCHAR2(1)																																																											

	DESCR_AREE_SV VARCHAR2(100) Z_MON_99152_110271 VARCHAR2(1) DESCR_ZONE_MON VARCHAR2(100) COD_ASL VARCHAR2(3) NOME_ASL VARCHAR2(50) NOME_DOP VARCHAR2(50) SUP_MGE_HA FLOAT(126) PERIMETRO_MGE_KM FLOAT(126) POPOLAZIONE_FM_1991 FLOAT(126) POPOLAZIONE_FM_2001 FLOAT(126) POPOLAZIONE_F_2001 FLOAT(126) POPOLAZIONE_M_2001 FLOAT(126) COD_CATASTALE VARCHAR2(4) CAP_PRINCIPALE VARCHAR2(5) GDO_GEOMETRY SDO_GEOMETRY() Z_SV_DLGS_146_97_R VARCHAR2(5) COD_DOP NUMBER(10) ID NOT NULL NUMBER(10)
Display mode (legend, classification, style)	Legend: comuni 1:5000 Classification: Identificativo Perimetro [Km] Superficie [Ha] Codice ISTAT Provincia Provincia Codice ISTAT Comune Comune Codice Belfiore Codice Avviamento Postale Azienda Sanitaria Locale Ambito Edilizia Abitativa e Scolastica Comunità Montana Consorzio Comuni Denominazione Origine Protetta Area Obiettivo 2 Documento Unico Prog. 1997/99 Zone Montane L.991 1952 - L.1102 1971 Zone Svantaggiate DLGS. n. 146/97 proposta regionale Zone Svantaggiate DLGS. n. 146/97 proposta ministeriale Aree Svantaggiate L. 268/75 Livello Sismicità Ord. 3274/03 Style: boundary color RGB (255,215,0) width 1
OGC web services (WMS) URL	http://www.cartografiarl.regione.liguria.it/mapfiles/repertoriocartografico/CONF/INI/56.asp?service=WMS&request=getCapabilities

Six partners of the eleven have filled the form in part or in full.

Eight partners of the eleven have configured a geonode and a geoportal with metadata catalogue and web services.

Partner	Questionnaire	Geonode	Geoportal	Metadata ISO 19139/19115	OGC web services
Corse					
Murcia	X	X	X	X	X
Crete		X	X	X	X
Cyprus	X				

Lazio		X	X	X	X
Liguria	X	X	X	X	X
Marche					
Tuscany	X	X	X	X	X
Campania		X	X	X	X
RER	X	X	X	X	X
PACA	X	X	X	X	X

Tab 2. Summary results

Then our investigation focused more specifically on the three thematic levels of interest for which we have verified the presence of the dataset and the publishing service.

Datasets

Partner	Administrative units (*)	Shore line	Nature 2000 (*)
Corse			
Murcia	X		X
Crete			
Cyprus			
Lazio	X	X	
Liguria	X	X	X
Marche			
Tuscany	X		X
Campania	X	X	
RER	X	X	X
PACA	X		

(*) for these spatial data theme already exists the INSPIRE Data Specification

Publishing Services

Partner	Administrative units	Shore line	Nature 2000
Corse			
Murcia	X		X
Crete			
Cyprus			
Lazio	X	X	
Liguria	X	X	X
Marche			
Tuscany	X		X
Campania	X		
RER	X	X	
PACA	X		

In some cases, datasets and services are managed at national level by other organizations exclusively (Greece) or in an alternative way (France and Italy).

Based on the information received from the partner, we tested publishing services data using two open source WMS clients.

We did a test of services with two desktop GIS software, OpenJump (open source) and Gaia (free version - carbon tools project).

At first we created the URL connection for the services of the project's partners. Afterwards we tried to test the simple requests provided for WMS's services (getCapabilities, getMap, getFeatureInfo), for each cartography level indicated.

The coordinate of the map for the test were configured as WGS84 Lat/Lon (epsg:4326) obviously for obtaining a global consultation of cartography data.

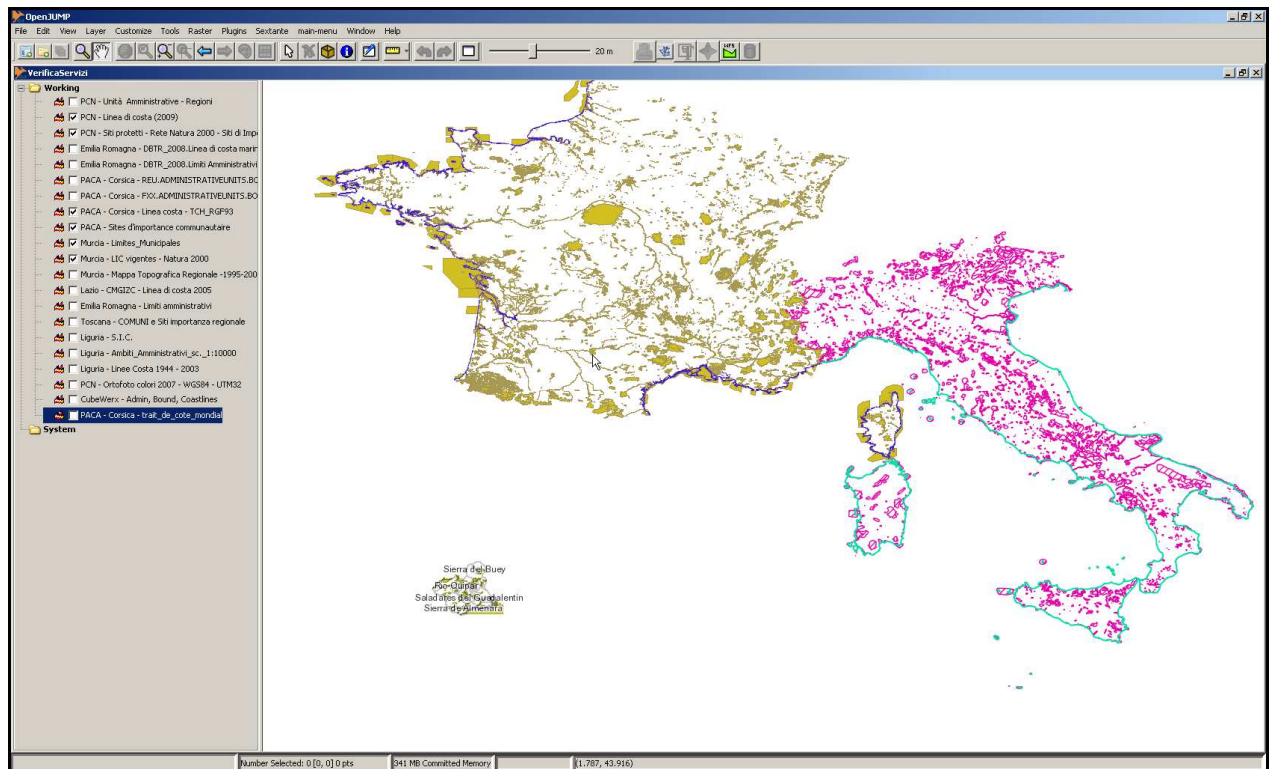


Figure 4. A test of WMS services

One of the problems seemed immediately apparent concern the standardization and harmonization of the shoreline data. So the next step was to compare of datasets available.

Follows the data structure for the thematic level proposals from region Lazio, Emilia-Romagna and Liguria.

Lazio

ID	unique identifier
REG	unique regional code
PROV	unique province code
COM	unique municipalit� code
CO_AMB_LIT	area of the coast
CO_TIP	type of the coast
CO-MORF	type of morphology
CO_MAT	type of material
CO_RET	X

PROG1	X
PROG2	X
OP_COD	X
OP_CLASS	X
OP_TIP	X
OP_TIPO	X
OP_LMM	X
OP_TIPO_CO	X
OP_RIF_INT	X
AGG	date of acquisition
NOTE	X
METADATO	X

Emilia-Romagna

GISID	unique identifier
ID_Fonte_RIF	identifier of source
ID_TIPO	type of shoreline
ACCURATEZZA	accuracy
DATA_INIZIO	start date
DATA_FINE	end date
ID_TIPO_PR	X
NOTE	annotation
ANNO	year of shoreline

Liguria

ID	unique identifier
TIPOLOGIA	type of shoreline
DESCRIZIONE	description of type of shoreline
CODICE_ISTAT	unique municipal code
COMUNE	name of municipality

Conclusions

The differences in approach are clear. The simple comparison of data structures, of course, does not exhaust all the issues that must be considered in order to achieve the harmonization, but allows us to highlight other elements of heterogeneity as the scale of acquisition and the accuracy.

But perhaps the most important element to be considered at the level of conceptual approach, is the definition of the application domain with the specification of concepts, objects/entities relevant, their attributes and relations.

Therefore we need a data specification for the shoreline as already exists for the thematic layers like administrative units and protected sites (Natura 2000).

The shoreline concept is present in a several theme covered by the INSPIRE data specification. The theme **Sea regions**, in progress of elaboration, developing more extensively the subject than others theme, that consider the shoreline as a reference.

So the next step of our work will be to analyse how this object is evaluated in the different INSPIRE data specification documents and how to adapt the data structures seen previously with the specifications already released or currently being processed.