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Congress  
on REgional  
GEOscientific  
Cartography  
and  
Information  
Systems

Earth  
and  
Man



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**EUREGEO**

Earth and Man

**Proceedings Volume II**

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Referat GeoForum Bayern, Geotopkataster  
Bürgermeister-Ulrich-Straße 160  
D-86179 Augsburg  
Telefon: +49 821 90 71 0  
Telefax: +49 821 90 71 55 56  
e-Mail: [poststelle@lfu.bayern.de](mailto:poststelle@lfu.bayern.de)  
<http://www.lfu.bayern.de>

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TOPIC – COASTAL SYSTEM MANAGEMENT

## AN INFORMATION SYSTEM FOR INTEGRATED COASTAL ZONE MANAGEMENT

Paolo Lupino <sup>(1)</sup>; Alessandro Bratti <sup>(2)</sup>; Piergiorgio Scaloni <sup>(2)</sup>; Giovanni Perego <sup>(3)</sup> and Paolo Di Giacomo <sup>(4)</sup>.

(1) Regione Lazio, Gestione Aree Marine Protette.

(2) Regione Lazio, Centro Monitoraggio per la Gestione Integrata della Zona Costiera (CM-GIZC).

(3) Man and Machine, GIS Product Manager.

(4) Alpha Consult srt.

Lazio Region (Environmental Direction – Management of Protected Marine Area), through the Integrated Coastal Zone Management Monitoring Center (ICZM-MC), has launched an experimentation to make its data about territory, mainly those relating to coastal zones and marine environment, available.

### INTRODUCTION

The main objective of the ICZM Information System is to support the defence, management and planning of coastal zones and marine areas, by overcoming the difficulties still existing in exchanging territorial information among different administrations and stakeholders in this field.

On this occasion, the best I.T. technologies - equipped with the most recent standards - have been tested in order to achieve a real interchange of structured information among the different stakeholders, in accordance with the purposes of the European Directive INSPIRE.

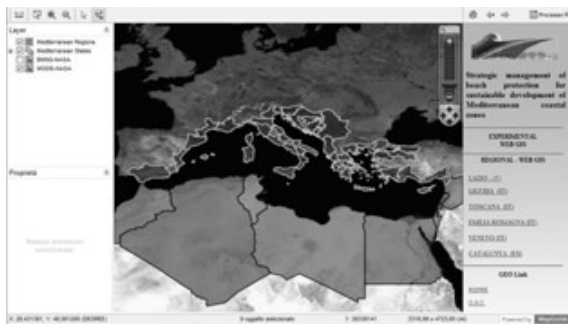


Figure 1 – Mediterranean Regions

These testing activities will be also used in the future initiative EURIOMCODE (European, Interregional and Mediterranean Observatory for Coastal Zone Defence and Management), proposed in the framework of the INTERREG IIC Regional Framework Operation BEACHMED-e, and whose partner leader is Lazio Region.

### WEB GIS SYSTEM

This System is defined as "a set of information of organization's interest and technical body and

organizational system that such information acquires, it processes, it makes available and it uses"(1). It is composed of a geographic database made of basic elements (points, lines, areas) and rasters, linked to a relational database that characterises and qualifies the information associated to the basic elements.

The prototype system is now available on the Web Site [www.beachmed.eu](http://www.beachmed.eu), in the section "Cartography", with the title Regional Web GIS - Lazio (IT).

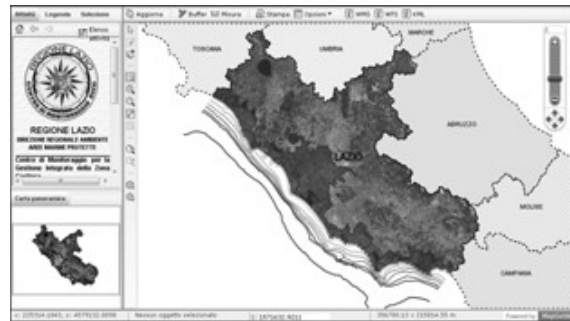


Figure 2 – The prototype of Lazio Region's Web GIS System for Coastal Zones.

In the section "Maps" of the web site, three Cartographies have been uploaded: the main cartography, which represents Lazio and the coastal Municipalities, and two detailed cartographies of Ponza and Ventotene.

The main cartography is composed of a raster, diversified among different visualisation scales: from 1:5.000 to 1:1.000.000. The main map has been structured on 11 topics composed of 50 layers:

1. Administrative boundaries
2. BASIC Cartography
3. Altimetry
4. Hydrology of littoral
5. Coastal use
6. Shorelines
7. Coastal Marine Environment
8. Coastal protected sites
9. Marine constraints
10. Marine Geology
11. Ortho-photo

The services have been diversified according to target users.

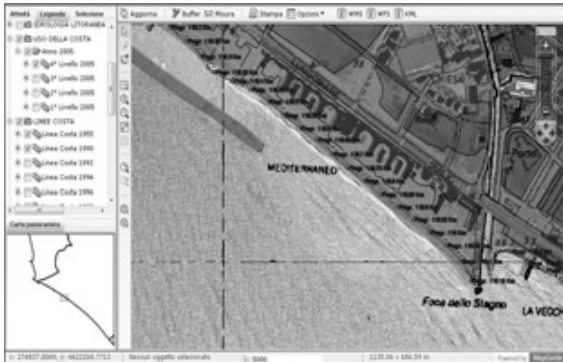


Figure 3 – Detailed Cartography of Web GIS System 1:5000

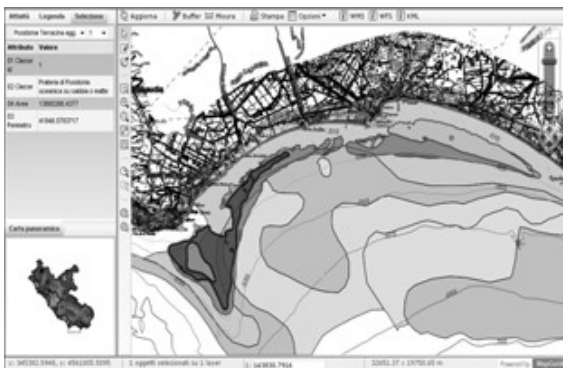


Figure 4 – Sedimentology of surface and posidonia oceanica

One of the most innovative aspects of Web GIS System is represented by the Ajax technology (Asynchronous JavaScript and XML), used for the data transfer.

This technology enables to submit "asynchronous" requests to a Web Server, thus improving the Web Site performances. This is especially true for Web GIS, when it has to provide large quantities of data in a timely manner. Moreover, this technology is compatible with all the main browsers and operative Systems and it does not need a plug-in installation to visualise maps.

## INTEROPERABILITY AND DATA INTERCHANGE

ICZM-Monitoring Center has always considered the exchange of data between different administrations working in the same territory as very important. Previous experiences with Web GIS Systems, developed since 2000, made these

exchanges possible thanks to special addresses, using the owners' data formats of the cartographic server in use.

Nowadays instead, different standard formats are available. Therefore, the formats we decided to use are those elaborated by the Open Geospatial Consortium (OGC), Web Map Service (WMS) for raster images and by the Web Feature Service (WFS) for vector data. The Keyhole Markup Language (KML) - developed on the basis of XML starting from Google Maps and Google Earth - was also added and it is spreading with good results.

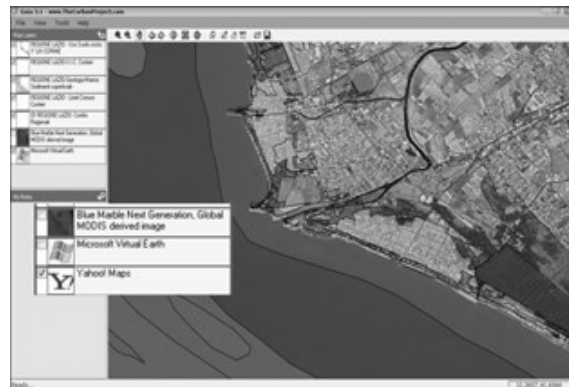


Figure 5: Cartography visualised with WMS, overlapped to data coming from Microsoft Virtual Earth and Yahoo Maps



Figure 6: Cartography visualised with VMS in the geoportal INSPIRE

In particular, for less experienced users and for public users, it has been possible to visualise and examine cartography on Google Earth, thanks to widget KML. It is interesting to remark that KML is now part of the Open GIS Consortium (OGC) standards, 2.2 version. KML have been built on postponed mode, that is to say that the vector element is supplied directly by the MapGuide Cartography server, while the attributes of the single elements have been enriched with information and links, directly written in html code.



Figure 7: Cartography visualised in Google Earth with attributes

The access functions to WMS, WFS and KML services, are located on the top of Ajax viewer. WMS catalogue is composed of seven themes that are georeferenced to ETRS89 system, OGC code.

### CHARACTERISTICS OF DATA

All vector data are expressed in ETRS89, while raster data are expressed in UTM33N ED50. Therefore, the projection of all the elements on the cartographic portal is expressed in UTM33N ED50 System. WMS/WFS/KML services (for vector data) are expressed in ETRS89 in order to be available for everybody and to fit all the projections.

More than 8.000 vector and raster files expressed in different geospatial formats (Sdf, Shp, Dwg, Ecw, Geotiff, ecc.) have been used so far; they are linked to a relational database composed of 24.000 records (Microsoft SQL Server).

### GIS SOFTWARE

The organisation and the editing of data as well as the analysis of territorial dynamics have been carried out with AutoCAD Map 3D. Thanks to the new FDO technology, it has been possible to integrate data coming from very different sources. Moreover, GDL 2009 application (Alpha Consult - Roma) has made it possible to organise data in a harmonised and univocal way according to the architecture foreseen for this System.

Autodesk MapGuide Enterprise is being used to publish data on the Web. It uses the same FDO technology and supports the most recent standards, also thanks to the its Open Source version.

Autodesk MapGuide Studio was used for the authoring section, due to its close relation with the server and its user-friendly mode.

### TERRITORIAL INFORMATION SYSTEM

This System is structured as a client/server architecture. The client part uses different cartographic work-stations located in several

offices, using the geographical data editing and authoring tools provided for the Web GIS.

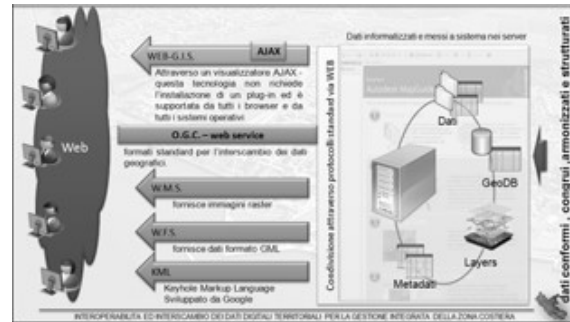


Figure 8: System structure

The data to be shared on the Web are contained in a computer farm equipped with a dedicated 10GB broadband fibre optic network and composed of two servers: one dedicated to the online cartography services with Autodesk MapGuide Enterprise, and the other specialised in database services with Microsoft SQL 2005.

### OBJECTIVES FOR THE FUTURE

The work that has been carried out so far will be further developed by implementing the geographical digital data shared with Web GIS in a quantitative and qualitative way. We intend to develop Web data management services (WPS - Web Processing Service) for the research, examination and analysis of data, also using Map Algebra local operators on WCS (Web Coverage Service).

Finally, it is vital to publish metadata in accordance with the ISO/TC211 commission standards, as provided for by the directive INSPIRE.

### NOTES

- (1) Massimo Rumor, Paolo Mogorovich, *Corso in Sistemi Informativi Territoriali 1*, IUAV Venezia

Regional Framework Operation Beachmed-e, *Strategic Management of Beach Protection for Sustainable Development of Mediterranean Coastal Zones*, Technical Reports Phase A, B, C. [www.beachmed.eu](http://www.beachmed.eu)