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From a Project to a Geoportal for Stakeholders and Public Information: the Case of the Clypea WebGIS

In this paper the case of the WebGIS of the Clypea programme is presented in its objectives and technical main features. The aim of this geoportal is to share research spatialized results in the field of the safety of the oil and gas upstream sector and innovation for future energies for stakeholders and public information. The architecture and functionality of the cartographic geoportal Clypea WebGIS are reported with a deeper insight to the DECOPLAT project, where information are provided on the progress of mining disposal activities (total removal or re-use) for offshore platforms that have reached the end of their life. Moreover, the Clypea WebGIS can be considered a significant case study on the research status on the relationship between wishes on publicly available spatial data and limits to produce and share them online.

Dal geoportale di progetto per gli stakeholders e per l'informazione pubblica a quello di programma: il caso del WebGIS Clypea

In questo contributo il caso del WebGIS del programma Clypea è presentato nei suoi obiettivi e nelle sue caratteristiche tecniche principali. Lo scopo di questo geoportale è quello di condividere con gli stakeholders e il pubblico i risultati della ricerca sulla sicurezza del settore upstream dell'oil and gas e sull'innovazione delle energie future. L'architettura e le funzionalità del geoportale cartografico WebGIS Clypea sono riportate con un approfondimento sul progetto DECOPLAT, nel quale vengono fornite informazioni sullo stato di avanzamento delle attività di dismissione mineraria (rimozione totale o riutilizzo) delle piattaforme offshore che hanno raggiunto la fine del loro ciclo di vita. Inoltre, il WebGIS Clypea può essere considerato un caso di studio significativo riguardo allo stato della ricerca sulla relazione tra l'auspicio di avere dati territoriali disponibili al pubblico e i limiti che si incontrano nello sviluppo e nella loro condivisione online.

Du géoportail de projet pour les parties prenantes et l'information au public au géoportail de programme : le cas de WebGIS Clypea

Dans cet article, le cas du WebGIS du programme Clypea est présenté dans ses principaux objectifs et caractéristiques techniques. L'objectif de ce géoportail est de partager avec les parties prenantes et le public les résultats de la recherche pour la sécurité de l'industrie d'extraction du pétrole et du gaz naturel aussi que pour l'innovation pour l'énergie du futur. L'architecture et les fonctionnalités du géoportail cartographique WebGIS Clypea sont présentées aussi que le projet DECOPLAT, où des informations sont fournies sur l'avancement des activités de démantèlement (retrait total ou réutilisation) des plates-formes offshore qui ont atteint la fin de leur cycle de vie. En outre, le WebGIS Clypea peut être considéré comme une étude de cas importante sur l'état de la recherche concernant la relation entre les données spatiales souhaitées et publiquement disponibles et les limites du développement pour le partage en ligne.

Del geoportal para los interesados y la información pública del proyecto al geoportal de programa: el caso de WebGIS Clypea

En esta contribución se presenta el caso del WebGIS del programa Clypea en sus principales objetivos y características técnicas. El propósito de este geoportal es compartir con las partes interesadas y el público los resultados de las investigaciones para la seguridad de la industria del petróleo y del gas y en la innovación para la energía futura. La arquitectura y las funcionalidades del geoportal cartográfico WebGIS Clypea se comunican en mas profundidad con el proyecto DECOPLAT, en el que se proporciona información sobre los progresos de las actividades de desmantelamiento minero (eliminación total o reutilización) de las plataformas marítimas que han llegado al final de su ciclo de vida. Además, el WebGIS Clypea puede considerarse un importante estudio de caso sobre el estado de la investigación de la relación entre los datos espaciales deseados disponibles públicamente y los límites del desarrollo para el intercambio en línea.

Keywords: *geographic information systems (GIS), WebGIS, oil and gas, public geography*

Parole chiave: *sistemi informativi geografici (GIS), WebGIS, idrocarburi, geografia pubblica*

Mots-clés : *systèmes d'information géographique (SIG), WebGIS, hydrocarbures, géographie publique*

Palabras clave: *sistemas de información geográfica (SIG), WebGIS, hidrocarburos, geografía pública*

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1. Introduction

Following the evolution of geographic information systems (GIS), research centers, firms and public administrations are called to collaborate to disseminate the spatial dimension of the gathered data and their analysis to interested communities and, more broadly, to the public. This activity can be reconnected to the «GIS as media» (Sui and Goodchild, 2001), discourses on public geography (AGEI, 2018) as well as institutional practices. In this latter perspective, especially when the research is publicly funded, the dissemination of the results is required to be publicly available by regulations as set in European programmes such as *Horizon 2020* and by the principles of geographical data set by the INSPIRE directive[1], or the implementation of the Italian digital code for the public administration[2] on open data and by the Consulta nazionale per l'informazione territoriale e ambientale[3].

The development of WebGIS technologies, originated from the combination of GIS and web technologies, has represented a natural answer to the growing requests for dissemination and use of geographical information data thanks to the fact that WebGIS systems streamline the exchange of geographical data, provide specific structured information, and empower users to access GIS applications without using any specific software, from the perspective of the final user. Since early days, examples have grown in Italy; examples cover all types of fields of research or topics promoted by the Italian public administration, thus ranging from geological and earthquake hazard data (Pessina and Meroni, 2009) to tourism (Mairo and Giacomini, 2005).

In the last twenty years, taking advantage of WebGIS opportunities, hundreds of websites and repositories related to Italian data have developed and spread in the world wide web with a project approach. This shows a lively and creative potential of the research communities as well as the willingness of external communication of public administration; however, compared to the noble objectives of dissemination, the result can be argued rather a widespread entropy of spatial data and geodatabases dispersed in offices, archives, websites often not maintained and updated. Although the wish for standardization and structured collection can be observed in the previously mentioned policy guidelines, it is clear from experience that this process is still far from being achieved. Therefore, at this stage, a pragmatic approach seems reasoning not by project but by programme. That is to foresee a single WebGIS platform to collect the geo-referenced results of a group of projects.

In this framework, in this paper the case of the WebGIS of the Clypea programme (in short Clypea WebGIS) is presented in its objectives and technical main features. In particular, with «Clypea» is intended the programme launched in 2014 by the Directorate general for the safety or the energy and mining activities and the National mining office (DGS UNMIG) of the Italian Ministry for the economic development in order to create a network of research and state institutions aimed at promoting offshore safety advances and innovation for future energy (Antoncecchi and Teofilo, 2017; Terlizzese and others, 2017).

2. The evolution of an idea and the main architectural features of the Clypea WebGIS

The evolution of WebGIS spatial data can be organized in three phases: data access and dissemination, data exploration and geovisualisation and the last level providing spatial data process-

ing, analysis and modelling. The idea of creating a platform collecting the spatial georeferenced data and non-spatial attribute data in one-single-WebGIS to allow the possibility to perform spatial searches and overlays, was created with the aim of promoting the dissemination of knowledge and transparency on the activities of Clypea network to stakeholders and citizens (Di Simone, Di Gregorio and Terlizzese, 2017). This to share with stakeholders problems and solutions that have important effects on the environmental, economic and social aspects of the national offshore areas and territories, regarding the safety activities related to the oil and upstream sector. Moreover, the Clypea WebGis is aimed at sharing the technological experience on GIS of the members of the network, thus to consolidate the relationships between the 16 partners involved.

Physically located at the premises of the Ricerca sul sistema energetico – RSE S.p.A., a research organization controlled by the GSE – Gestore dei servizi energetici, in the field of energy strategic project, the Clypea WebGIS is intended to be publicly available as part of the broader Clypea web site (*www.Clypea.org*). The hardware and software architecture (fig. 1) is a client-server type where all the data, provided by the organizations involved in the Clypea projects, are resident on servers in a geo-database. These are published using a map server and an Apache web-server in Windows environment and the client, i.e. the remote user, does not need any specific software but a simple last generation Internet browser.

The Geoserver application is used for the map services, it takes the data from the geo-database, processes them, and generates the relative services that are displayed on the client side. Yet, for the data, the system uses a PostgreSQL database with PostGIS spatial extension for storing all application information, since multiple simultaneous access of multiple users and remote access through the Internet require a robust storage platform and no particular space limitations for the contents. Moreover, the tool is developed in an open-source environment and uses the SW Heron-OpenLayers libraries.

The features offered by the application can be clustered into four main types. Firstly, the basic and customized functions, respectively for map navigation and data interrogation as well as for uploading local data files and remote services. Secondly, the functionality conceived for Clypea projects in order to view the related thematic maps. Thirdly, the functionality related to the DECOPLAT project, aimed at providing the status of the authorizations, the technical phases, and the environmental monitoring phases and general information on the disposal of mining. Finally, the functionality for the related projects and thematic map viewing.

In particular, in figure 2 below, the front page of the Clypea WebGIS is shown, from which the various sections can be interrogated and are visible to the client side. The choice is to be a simple and user-friendly interface recalling standard WebGIS features. On the left of the page, the level
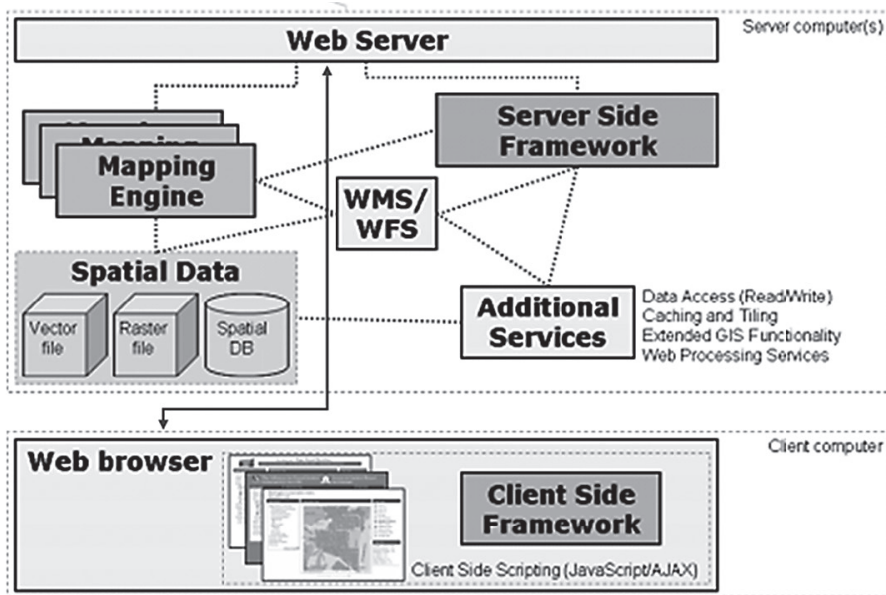

Fig. 1. HW and SW architecture of the Clypea WebGIS

frame contains the list of layers available in the application; at the bottom, again on the left of the page, two frames can be viewed that allow access to general data and documentation and to Internet sites linked to the projects considered. At the bottom of the page, the logos of the scientific partners of the Clypea network are represented, which allow direct access to the respective websites; the same standard graphical logic is used at the top, where the UNMIG website of the Ministry of economic development (*http://unmig.mise.gov.it*) and Clypea logos are located. The tools (icons) leading to the navigation of the map, data search, drawing and graphic returns, help (Help) are on the top bar of the page. Moreover, on the central part of the page, the map is represented with a cartographic background selectable by the user on which the various layers of interest overlap; there is also the zoom bar and on the central part of the page on the right, there is a dynamic locator that allows a quick navigation inside the map. Finally, to the right of the page, there is the legend of the themes in the maps.

Compared to the official Italian mining and geodatabase of the UNMIG WebGIS (Grandi and Coppi, 2018) and its new release in the new UNMIG thematic website in April 2019, provided thanks to the ArcGIS WebGIS platform[4], the data in the Clypea WebGIS are the results of research projects and these might not be yet fully official,

but rather useful and working maps to be used for future investigations.

The possibility to view the information will be public on the Clypea website, but access to the data will be provided by registration and authentication for statistical purposes and, thanks to a specific request to the person responsible for the website, this choice assures to have the permission of the owner of the data (i.e., research centers or universities) and of the Ministry of economic development that is the funding of the Clypea programme. A significant work has been done in order to streamline the intellectual property issues related to geodatabase and the cartographic rendering of these data, that often is forgotten to be planned when the ideas of geodata portals are conceived. This fact, instead, is one of the most complex and hindering actual facts creating complexities and delays.

Future developments of the Clypea WebGIS include: the definition of the Help function; the completion of the information sheets for each decommissioned platform and the updating of the ongoing divestment activities (DECOPLAT project, see the following paragraph); the collection and implementation of general documentation (technical, legal, regulatory etc.); the integration of other Clypea projects or related to them ones; the collection and implementation of videos, photos etc. on the subject of disposals, of a general
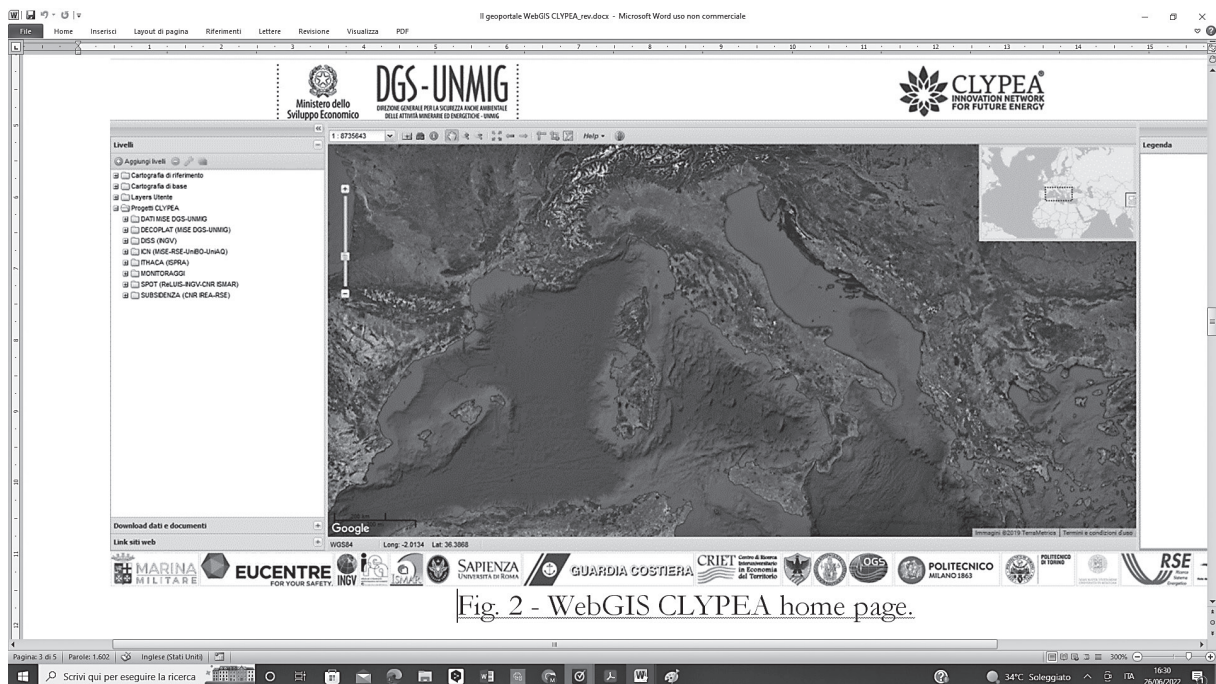

Fig. 2. Clypea WebGIS home page

or specific nature; the updates of the monitoring data for the various environmental components and the completion of the English version of the texts to ensure a wider global dissemination and use of the research results.

3. The DECOPLAT project and its WebGIS

The following main Clypea projects provided spatially referred information collected in the Clypea WebGIS: the «national composite security index» (Cianella and others, 2017); the monitoring activities and innovation technology in offshore activities (Terlizzese and others, 2017); the «Spot Project» providing a significant amount of data related to potentially triggerable offshore seismicity and tsunamis (i.e., DISS Working Group, 2018; Antoncecchi and others, 2019); the «Subsidence project» (Manzo and others, 2019) and the «Safe and sustainable decommissioning» (Grandi and others, 2017).

Data ranges in different levels of technical complexity according to the objectives, i.e. providing input data to modeling and design – thus mainly thought for internal use among the researchers of the Clypea network – or sharing with a large set of different non-technical stakeholders.

This latter is the case for the information on the progress on decommissioning activities related to the offshore platforms, the so-called sub-project DECOPLAT – DECOmmissioning PLAT-forms. DECOPLAT is connected to the «Safe and sustainable decommissioning» promoted in 2017 and ended in 2019, aimed at defining a safe and sustainable technical-operational program for the mining disposal of offshore oil and gas platforms (Grandi and others, 2017). Decommis-

sioning of the offshore platform is not just a technical and an engineering issue, but it represents a social and territorial symbol that catalyze media attention, firms specialized in this fields, local «No Triv» committees, environmental organizations etc. Thus, next to the effect of the participated initiatives held in the years 2017-2019 (*ibidem*) a pilot project was conceived in order to provide a simple and user-friendly georeferenced and spatial information potentially to a non-specialized public.

The project first was developed as an autonomous page where a citizen could gather information on the status of a platform, realized on the participative work of Antoncecchi and others (2017), within the *Future of the Platform Forum*. Through the ÝECOPLAT layer, it is possible to display the exact position of the offshore platforms scheduled for decommissioning on the map. It is also possible to display the informative pop-window with the list of the same (fig. 3). There are also links to access general reference documents, images, and videos on upstream and decommissioning of oil and gas installations. By clicking on a platform shown in the list, a window appears (fig. 4) showing the progress of the phases: *a)* authorization (administrative aspects); *b)* techniques (technical aspects); *c)* environmental monitoring (control aspects).

The horizontal bar shows the percentage of total progress for each of the aforementioned phases, assessed by considering the completed activities, i.e. those indicated by a green check (note: if the check is gray it means that the activity is still ongoing and, therefore, not is considered in the percentage of progress) compared to the total of the activities to be completed, required by the national guidelines on decommissioning attached
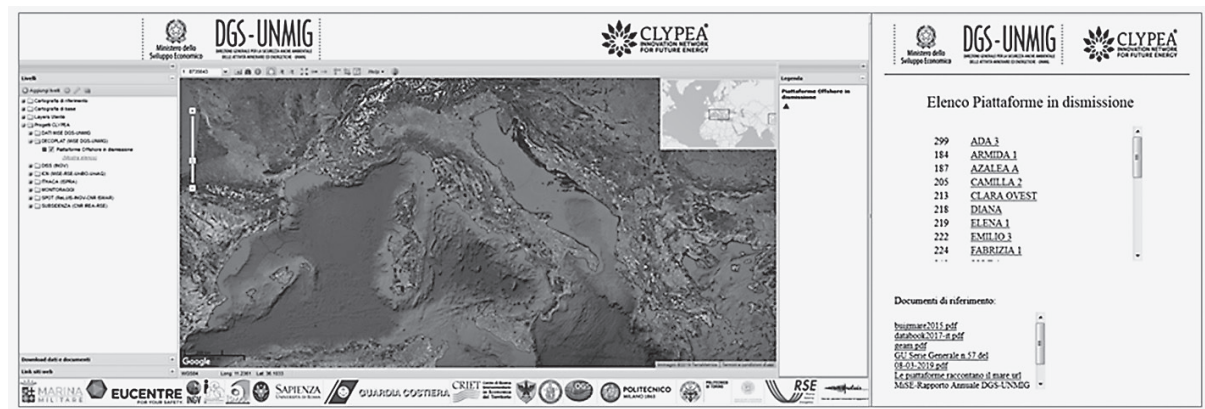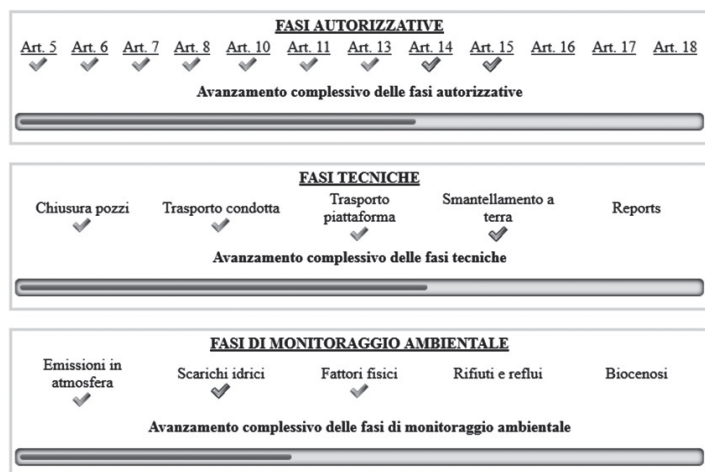

Fig. 3. DECOPLAT: offshore oil and gas platforms scheduled for decommissioning (on the left) and related list (on the right)

EMILIO 3 (222)
Vedi dettaglio piattaforma

FASI AUTORIZZATIVE

Art. 5 Art. 6 Art. 7 Art. 8 Art. 10 Art. 11 Art. 13 Art. 14 Art. 15 Art. 16 Art. 17 Art. 18

Avanzamento complessivo delle fasi autorizzative

FASI TECNICHE

Chiusura pozzi   Trasporto condotta   Trasporto piattaforma   Smantellamento a terra   Reports

Avanzamento complessivo delle fasi tecniche

FASI DI MONITORAGGIO AMBIENTALE

Emissioni in atmosfera   Scarichi idrici   Fattori fisici   Rifiuti e reflui   Biocenosi

Avanzamento complessivo delle fasi di monitoraggio ambientale

Rapporti: Foto: Video:
222_DEC-VIA-2000-5222.pdf   222_immagine.png   222_monitoraggio.url

Fig. 4. Progress of the authorization, technical and environmental monitoring phases

to the ministerial decree of 15 February 2019. For each individual activity of the various phases, a brief description of the action is provided by tooltip, which can be activated by hovering the mouse over the name; furthermore, it is possible to access detailed information by opening the link on each individual item. At the bottom of the window, there are other links to documentation, images, and videos related to the selected platform; the technical descriptive information of the plant, with a relative photograph, are accessible through the link placed under the name of the platform.

Differently to the MISE UNMIG official Web-GIS, the work of RSE attempts to provide a more visual feelings to stakeholders with colors and a structured set of phases that should enrich and make the status of a platform easier to understand.

4. Progress and limits of WebGIS platforms in the field of energy and oil and gas safety: learnings

The Clypea WebGIS evolution can be considered a significant case study on the research status on the relationship between wishes on publicly available spatial data and limits to produce and share them online. Learnings from this ongoing experience show that moving from a project to a programme WebGIS platform presents point of

strengths and opportunities, but threats arise as well. Among the first, one can list the economies of scale both in financial and human resources in the phase of development and in the maintenance one, a better standardization and a likely comparability of data in terms of geodetical references, statistical homogeneity etc.

Moreover, traditionally, GIS were highly centralized, required knowledgeable users and software was typically stored on individual desktop computers and operated by specialists. This is still the case for advanced use, for instance to perform fully flexible and customized analysis and modelling. Generally, WebGIS, like the Clypea one, tend to provide spatial data access for dissemination, exploration and geovisualisation. WebGIS technology facilitates the availability and dissemination of spatial data with interactive functionalities creating dynamic maps with a number of features that include advanced analytical and cartographical tools such as overlaying.

In the field of energy and oil and gas related activities, a number of initiatives have been developed in the last decades. Two of the oldest WebGIS have been the first release of the UNMIG WebGIS and the VIDEPI database (Santocchi, 2017; Grandi and Coppi, 2018) that provided a first *ante litteram* open data approach valuing the features of Google Earth, but in both of these cases, likewise in the case of other famous geodatabase in the field of

energy (i.e. the *Altas of Renewable Energy Source* by GSE), there is only one institution collecting, owning and managing the data. Clypea WebGIS tests the complexity of sharing the data, first among the owners. This seems one of the most complex aspects for copyright management, but also for change management and a certain resistance toxc share data among institutions and publicly, different from the source geodatabase systems among Clypea participating institutions. Another quite overlooked phase in implementing WebGIS targeting the public seems the disregard of the importance of iterative user testing and the revision process. Since the beginning, the need to properly plan tests and the evaluation phases should be taken in consideration and shared. Moreover, complexity arises because of the need to assure high security standards. Last, but not least, the need for high-level commitment is fundamental to ensure resources for regular technical support, for regularly performed communication, awareness, and training strategies as well as the maintenance of data and technology platform. Experts needed to coordinate and maintain a WebGIS platform require highly skilled knowledge and a strong understanding of the data itself, thus a change in staffing might lead to the abandonment of WebGIS systems due to the difficulties to ensure a proper and scheduled turnover.

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Notes

[1] Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for spatial information in the European Community (INSPIRE).

[2] Italian legislative decree 82 of 7 March 2005.

[3] According to art. 11 of dlgs 32/2010 and regulation set by the Italian decree of the president of the Council of Ministers of 12 January 2016.

[4] *https://www.arcgis.com/home/webmap/viewer.html?webmap=13fee4db46bd40a7a0113faf8cf1812e&extent=9.0555,42.3802,17.1689,45.8339* (last access: 13.XI.2020).