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Geo-spatial Information**The development of the Istat GeoPortal****Note by the Italian National Institute of Statistics (Istat), Rome, Italy****Summary*

In 20 years' experience, geospatial activity applied to statistics had a significant growth in the Italian National Institute of Statistics. Istat is active in the field of producing and disseminating geospatial and georeferenced statistical information since 1995, when the census mapping cartography was firstly digitized. A geographic information system, named Gistat, has been developed and enhanced to support past and future censuses and many other projects based on territorial frameworks. Today Gistat is also available on the Internet to publish Web MapServices of geostatistical data and interactive Web GIS applications. The base of a GeoPortal has been tested with the creation of a geo-metadata system; then a Catalogue Service for Web (CS-W) was published on the Internet to make those datasets and MapServices discoverable and interoperable. A new GeoViewer is also on a developing phase to support the users to better integrate statistical and geospatial information.

The document describes the basic components to develop the Istat GeoPortal, a unique access point for geographic and georeferenced statistical data.

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I. Introduction

1. In the last two decades the availability and the use of geospatial information linked to statistical data became a crucial element for planning, monitoring and developing projects and policies of different kinds (environmental, economic, social, and cultural) and for achieving the targets of the digital agenda. That has been widely recognized and even international bodies encourage and support initiatives of georeferencing and geocoding statistical data. Several data models and tools to integrate statistical and geospatial information are already under regulations and other are still under testing processes.
2. The integration of statistical and geospatial information is a common theme at local, national, European and global level. There are many on-going initiatives focused on that concept with the basic idea of defining a common framework for the integration.
3. The concept of bringing location to statistics requires a tight cooperation between National Statistics Institutes (NSI) and National Mapping and Cadastral Agencies (NMCA). On that direction many projects for georeferencing and geocoding statistical data have been started.
4. At global level, the United Nations Statistics Division created since several years, some expert groups on the use and integration of statistical data linked to geospatial information to support the sustainable developments goals and the 2030 agenda.
5. At Eurostat level is active a task force with a precise mandate for the integration of geospatial information and statistical data in the European Statistical System (ESS). The INSPIRE directive, Infrastructure for Spatial Information in the European Community, is also driving in the direction of enhance the ESS through the harmonization of statistical units and population distribution. INSPIRE gives directives and specifications to Member States to share geospatial information through discovery, viewing and download services published on standard National Spatial Data Infrastructure (NSDI).
6. At national (Italian) level there are several on-going initiatives regarding the harmonization and dissemination of geospatial data; those initiatives are also focused on the production of metadata. The creation of metadata catalogue services is promoted to facilitate the discovery and use (and re-use) of spatial and geostatistical information. Italian Agency for the Digital Agenda (AGID) is the national agency supervising the adoption of the digital code for public institutions in Italy, in terms of geospatial information defined the rules for “cataloguing territorial data” for public institutions. AGID implemented a National Repertoire for Territorial Data (Repertorio Nazionale Dati Territoriali – RNDDT) geoportal to which public institutions have to contribute to make geospatial information discoverable and interoperable.

II. The development of the Istat GeoPortal

7. In that context of integrating statistical and geospatial information, for NSIs it is essential to use and interact with geographic data. Istat, the Italian National Statistics Institute, is active in the field of producing and disseminating geospatial statistical information since 1995, when the census mapping cartography was firstly digitized. In more than 20 years’ experience, geospatial activity applied to statistics had a significant growth in the Istat.
8. Gistat has been developed and enhanced to support past and future censuses and many projects based on territorial frameworks.
9. Gistat stores in a spatial-temporal geodatabase, at various time periods, census mapping cartography as well as many geographic datasets such as: “commuting areas”,

urban aggregates, election districts, data coming from external sources such as street networks, and aerial photos. The 1 km population grid is also present and it has been built according to EU specifications to support the cross-border statistics in the ESS (European Statistical System).

10. Most of these data are available on the Internet through WebMapServices of geostatistical data and interactive Web GIS applications. (<http://gisportal.istat.it>).

11. The need of building a GeoPortal arose with the development of Gistat, both to make data and geospatial services discoverable and interoperable, both to promote and enhance the use of geospatial data and tools versus statistical users.

12. The base of a GeoPortal has been set-up and tested with the creation of a metadata system for geographic data. The metadata catalogue for geographic data has been implemented, according to the national standard RNDT and the INSPIRE profiles.

13. CS-W available on the Internet to make those metadata searchable through standards. Moreover, a GeoViewer is also on a developing phase to support the users to better discover, view and navigate geospatial and georeferenced statistical information.

14. The following paragraphs describe the basic components to develop the Istat GeoPortal in order to guarantee a unique access point for geographic and georeferenced statistical data.

III. The GeoMetadata and the Catalogue

15. The GeoMetadata catalogue is the base for sharing geospatial data; the data are described through metadata sheets using a profile that store in a standard way the parameters so that data can be searched, view and downloaded. The Metadata Catalogue facilitate the discovery and reuse of spatial and georeferenced information.

16. This implementation addresses different data sources through which each resource is made available. Many types of resources are made available through CS-W, such as: Datasets, MapServices, WebGIS Applications, and many others.

17. The Metadata Catalogue is a step toward the creation of Istat GeoPortal. The metadata catalogue provides the GeoPortal with a unique access point for geographic and georeferenced statistical data (Figure I).

18. The Metadata Catalogue is the point where geospatial data consumers meet data producers.

19. As already mentioned, in Italy AGID already implemented a RNDT GeoPortal, to which public institutions have to contribute to the RNDT by compiling metadata for the datasets they produced. That is oriented to apply the recommendations for the Digital Agenda and to avoid data duplication.

20. RNDT is a subset of INSPIRE, the standard for sharing GeoSpatial information in the EU, provides the technical specifications to create standard metadata to make geospatial datasets re-usable and interoperable.

21. The main functions provided by the system are briefly listed:

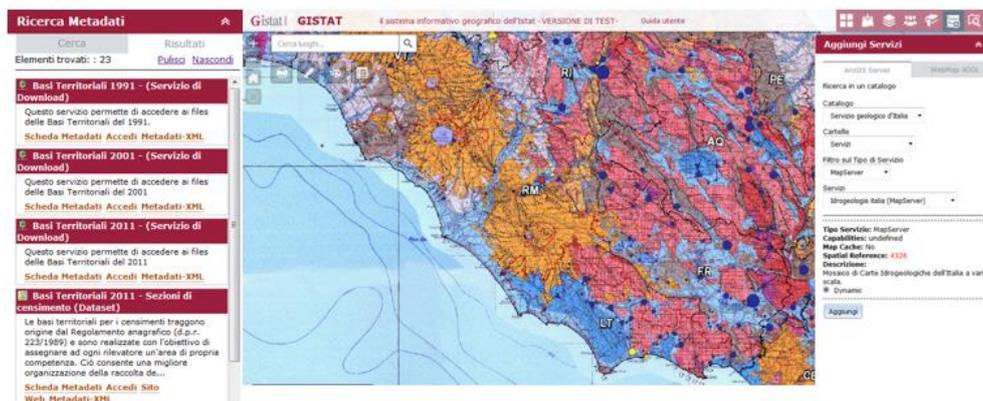
- (a) The creation of metadata sheets for the resources, so that could be shared according to the Open Geospatial Consortium (OGC) CS-W standard;
- (b) The search for data using spatial queries or attribute keys;
- (c) The publication of the services for discovery, view and download the data;

- (d) The search in federate catalogues, that use the same standards;
- (e) The integration of a GeoViewer to support the users to better discover, view and navigate geospatial and georeferenced statistical information.

22. Information stored in those metadata is referred as ‘referential’ metadata; that kind of information, according to RNDT and INSPIRE profiles, is useful to discover resources and to provide more information describing each resource discovered. Some of the main characteristics stored are listed below

- (a) Metadata owner and contact point;
- (b) Spatial and temporal extension of the resource and reference system;
- (c) Data description;
- (d) Distribution files formats and licensing;
- (e) Online resources links.

Figure I
Examples of searching in the Metadata Catalogue and Interaction with other GeoPortals



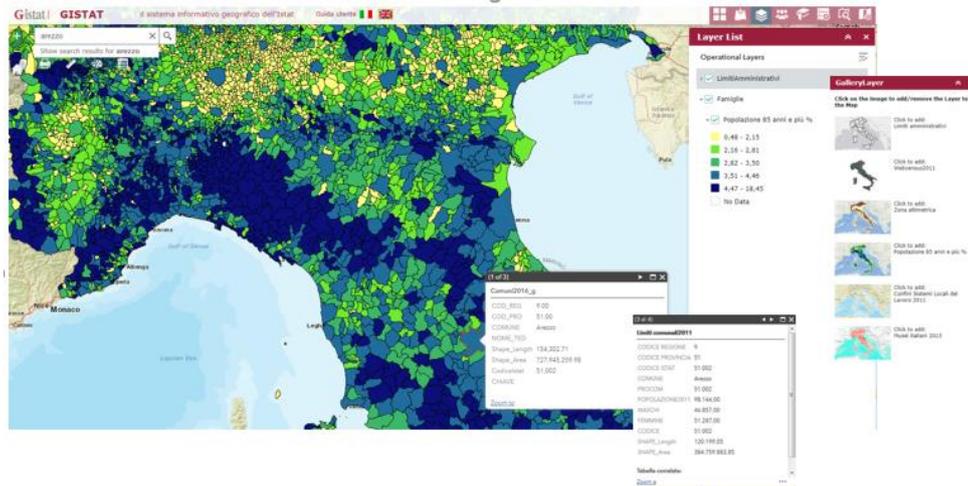
IV. The Istat GeoViewer

23. The Istat GeoViewer is a new WebGIS application oriented to search, view and navigate MapServices discovered on the web.

24. The overlay of geospatial data coming from different sources is easily possible. Interoperability is guaranteed through the access to discovery services to standards CS-W catalogues available in other GeoPortals.

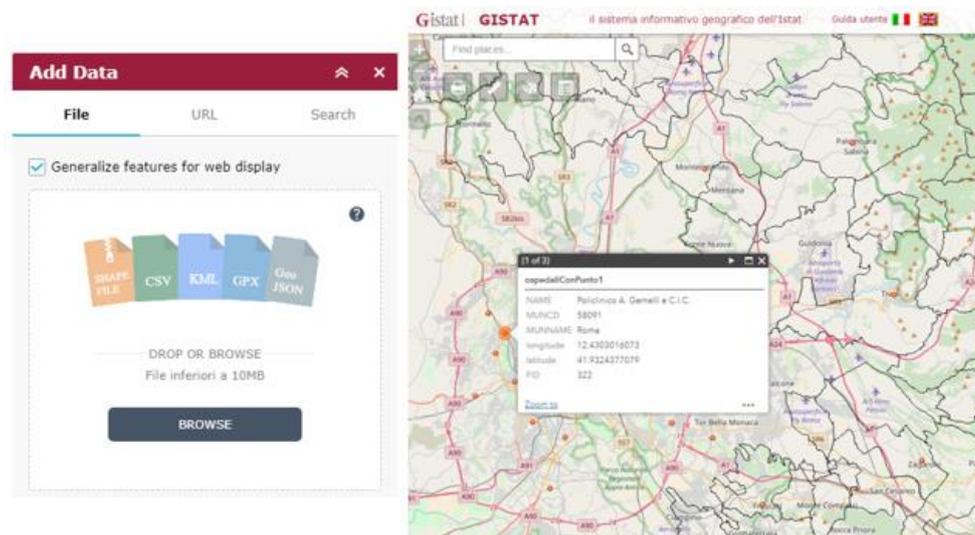
25. User interaction is facilitated by a custom ‘Gallery layer’, see Figure II. It is a list of the most popular maps, identified by an image and a short description. The user simply click on the image and the corresponding map is displayed on top of the other layers; then the new added map is listed on the layer contents and can be queried, for example using the ‘click’ on the displayed objects.

Figure II
The Istat GeoViewer: User interaction – Gallery layer



26. The Istat GeoViewer provides the overlay and analyses of data and maps, both using MapServices, searched through catalogues on the web, both with the use of local geographic and georeferenced data owned by the user. That means that users can dynamically load data on the map, accessing to geometries stored locally to their own computers that is possible for different file formats, such as: CSV, JSON, and Shapefiles. In this way the user can load more recent versions of the data and compare to those published and available through GeoPortals (Figure III).

Figure III
The Istat GeoViewer: Interacting with local data sources
(For example: Hospital added from a X, Y file coordinates)

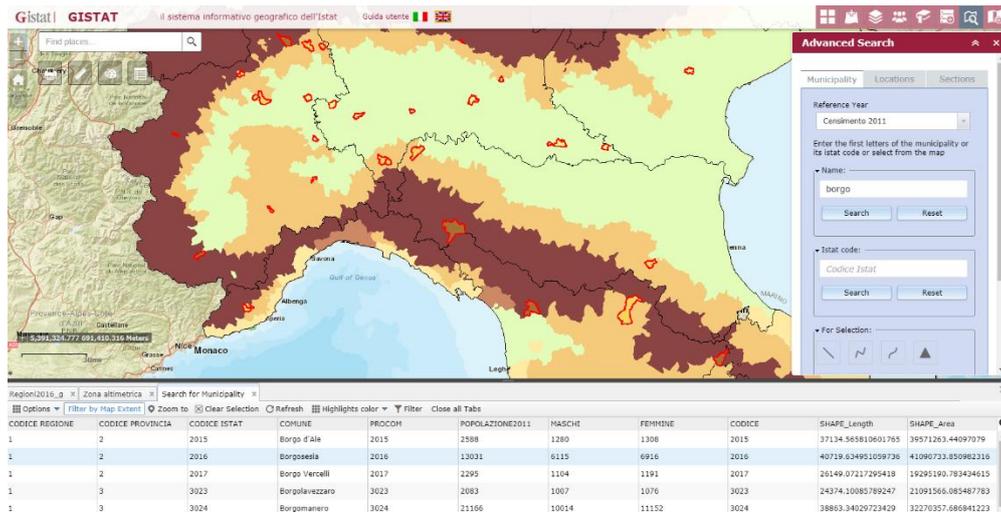


27. Advanced search functions focused on census data are available, to perform advanced spatial and attribute queries; those specific tools have been re-used from previous experience and are also available in other web applications <http://gisportal.istat.it/bt.viewer/>.

28. Those functions provide geospatial tools combined to attribute queries (see Figure IV). The users can interactively design an area on a map and investigate on ‘what’s inside a user defined area’ and dynamically get the statistics on those data or measure on the map, getting real lengths and areas. They can, for example, investigate ‘who is living and working close to the borders’ and then access the census data of the affected people.

29. Moreover, the Istat GeoViewer re-uses also other widget already available in other WebGIS application. The maps are printable using templates layout and can be exported to PDF files.

Figure IV
The Istat GeoViewer: advanced search on census data



V. Conclusions

30. Users and citizens are increasingly demanding for more sophisticated statistics to be able to describe and analyse the people, the society, the economy, the world. The need of having a unique place to access and share geospatial and georeferenced statistical information is becoming crucial. The integration of statistical and geospatial information helps in that direction. Most of statistical data are related to places so data can be georeferenced (or location-enabled) to become geospatial statistics; the GIS tools make easy to access and use those data and help the users to navigate and geo-process data to produce new information.

31. Moreover, as it is mentioned in other presentations, Istat is moving towards the establishment of the Register of Places and of Geographical Units (RSBL); following the European and international recommendations, the objective is the definition of a point-based framework to have new territorial dimensions in the statistical production.

32. In that context the development of an Istat GeoPortal is a new challenge to support future censuses, as well as many other projects based on territorial frameworks.