Regional SDI web services to support urban planning processes and brownfield redevelopment in Lombardy

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ABSTRACT: The Urban Planning SDI of Lombardy fulfils the needs highlighted by regional land and urban planning acts, as far as transparency and publicity of land use changes are concerned. Local administrations, while making urban plans, are supported by three SDI tools that can be accessed through the web. Such tools function as geographic information archives (allowing users to share reference spatial data themes), as digital repositories of the documents related to each plan, and as cartographic visualisers of synthetic urban planning maps. Among the spatial data themes, a brownfield geographic database for the territory of three Lombardy provinces (including Milan) represents an essential management tool for geographic information to be employed in land and urban planning. It will be updated in the framework of the periodical revisions of urban plans carried out at the local level.

1 THE URBAN PLANNING SDI OF LOMBARDY

The urban planning SDI of Lombardy has been established in 2006 to support the new territorial and urban planning regulations that have been approved in Lombardy since March, 2005 (Regione Lombardia, 2005; 2006a; 2006b). In particular, the new regulations highlight the need for shared implementation of spatial information that concern planning at the urban, provincial and regional level (NUTS 4, NUTS 3 and NUTS 2, respectively); they must be stored in a single SDI data warehouse ensuring their interoperability, comparability and integration, as well as a common strategy for online distribution to all the potential stakeholders.

Independent of the level of planning (urban to regional), the general system architecture is based on three fundamental tools:

- a digital geographic information archive to support planning activities ("Catalogue"): it consists of a library of pre-conceived spatial data themes, representing official reference bases, that are periodically updated and can be downloaded through the web;
- a geodatabase for urban planning, that implements synthetic maps for each plan, drawn at a 1:10,000 reference scale: a mosaic of such maps is published through a webGIS visualiser;
- a digital repository of the files related to each plan and its variants: it is an alphanumerical database, including an upload area for text and graphic attachments, meant to collect and publish through the web both the plan in digital format and the related administrative data.

As far as technology is concerned,

- the "Catalogue" is an ESRI ArcIMS Metadaexplorer and MetadaServer-based metadata archive, whose services are accessible through a web application. Metadata implementation proceeds through a *Metadatatools* desktop application, framed into the ArcGis architecture, with some functions developed *ad hoc*. The metedata repository is an Oracle9i/ArcSDE9.x database.

- The webGis visualiser is based on ESRI ArcIMS 9.x and Mapaccel 2.x solutions; the spatial data repository is an Oracle10g/ArcSDE9.x database.
- The digital repository has a front-end based on FLEX 3 technology, interfaced on server side through an HTTPService. The back-end is basd on a Java 6 technology. The database is an Oracle 10g.

The spatial data themes implemented by the "Catalogue" and the geographic database are subdivided into two main types, depending on the territorial level that they are created and updated at. Specifically, spatial data themes created and managed at super-urban level (that is, at NUTS 3 or NUTS 2 level) are classified as "A-type", while those created and managed at urban level (according to shared standards) are classified as "B-type".

1.1 *Digital information geographic archive.*

The "Catalogue" represents a free service, that urban and provincial administrations should employ while collecting spatial information preliminarily to the making of the plan. The "Catalogue" includes, first, thematic spatial data themes (topography, administrative units, transport networks, hydrography, protected sites, elevation, land cover, orthoimagery, geology, natural risk zones, hazardous industrial facilities, etc., covering a broad spectrum of the spatial data themes referred to in the Annexes I-III of the European Directive INSPIRE: European Union, 2007), managed at regional level and elected as reference bases for the planning activities in charge to subordinate administrative entities; and second, thematic spatial data themes available to provincial, urban or other administrations (e.g. protected site managers) if more detailed or not available at regional level. In both cases, the administration playing a user role (provincial or urban) has to report about corrections and/or updates needed by the reference spatial data themes, that the administration playing a provider role (regional to provincial) receives and processes. The administrations that have created spatial data themes more detailed than those included in the "Catalogue", or simply not included into it, have to contribute through them to the implementation of the "Catalogue" itself. Both correction/updates and more detailed contributions are transmitted directly as shapefiles that, after validation, replace the pre-existing analogues in the central geodatabase.

1.2 *Geodatabase for urban planning.*

This tool implements pre-defined spatial data themes inherent to each urban plan, displayed on synthetic maps. Such contents are the specific item of the *Tavola delle Previsioni di Piano* (Plate of Plan Previews: PPP) representing, at the moment, the cartographic tool more directly linking the urban planning activities to the construction of an integrated SDI. As mentioned above, the PPP is a synthetic map – an interactive digital map where the user can choose different layers to define the content of the map itself (Fig. 1). Through it, the urban administrations implement the dedicated SDI tool with the spatial information related to its planning previsions and, contemporaneously, update the reference spatial data themes provided, through the "Catalogue", by higher-level administrations. The reference topographic base (raster format) is represented by the Regional Technical Map at the 1:10,000 scale, complemented by the equivalent numerical cartography and by orthoimagery, last updated in 2007. This scenario is being integrated as the urban administration are creating modern topographic database, largely cofinanced by Regione Lombardia, according to the Italian *Intesa Stato-Regioni* standards (Regione Lombardia, 2008). The vector layers of the PPP (points, lines and polygons), have to be provided to the regional SDI in shapefile format: as far as they implement the geodatabase for urban planning, they contribute to the mosaic of urban planning at regional scale. This is accessible through a webVisualizer at the URL http://www.pgt.regione.lombardia.it/html/Strumenti. htm#MAPPING (Fig. 2).

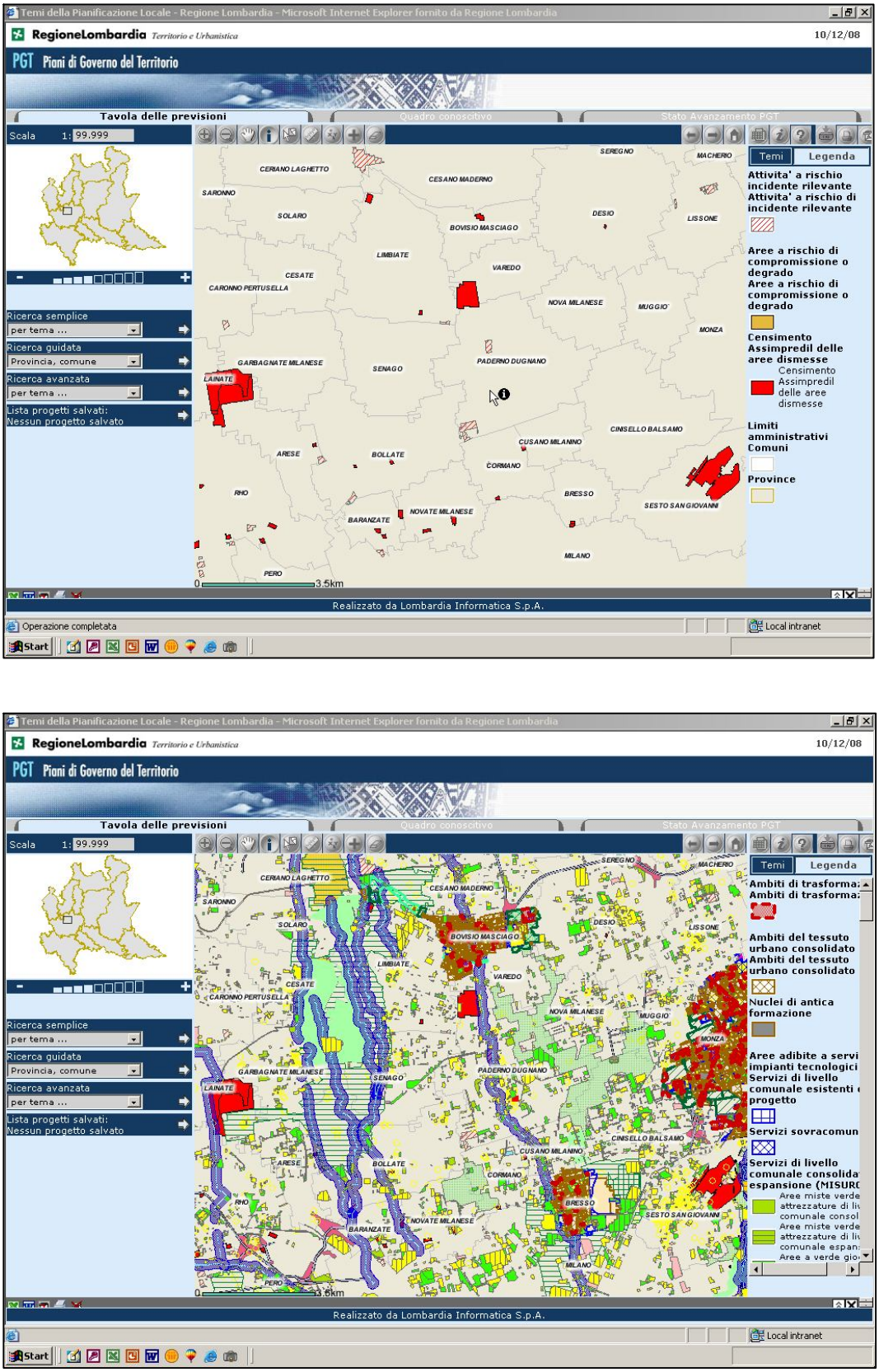

Figure 1. Synthetic maps available through the Regione Lombardia webVisualizer. In the map above, only information on the brownfields (solid red) and risky industrial plants (diagonal texture) is displayed; in the map above, also spatial data about urban and network planning, natural hazards, protected areas and cultural heritage are displayed for the same area

1.3 Digital repository.

It collects, through standard alphanumerical data entry masks, 1) information about the administrative acts and procedures inherent to the successive steps of kick-off, adoption and approval of each plan and to the related Strategic Environmental Assessment (including information about the due publications in the local and official press), 2) the whole urban plan (reports and maps) in digital format, and 3) metadata relative to each implemented file. While information 1) and 3) are entered directly from the urban level through a web-based interface, files 2) are delivered off-line and uploaded in an attachment area by the regional technical staff.

2 THE BROWNFIELD GEODATABASE FOR THE MILAN AREA

In the Milan area, the items of brownfield management and redevelopment are gaining attention as the metropolitan area is characterized by a continuous process of abandonment of industrial sites that become available for new urban development without further loss of land. Even in rural areas, abandonment may involve farming houses that can be rescued for residential purposes or can host touristic activites such as B&B and country resorts. Brownfields are often spoilt and/or polluted sites, but sometimes bear a remarkable historical or architectonical value (e.g. ancient farming houses, industrial archeological sites), that finds chances of preservation namely in a perspective of integrated site redevelopment. In other instances, brownfields can represent strategic development areas for sectors of the city center, where substantial expansions are hampered by saturation of the urban texture (Various Authors, 2008).

A brownfield geodatabase for the Provinces of Milan, Lodi, Monza and Brianza has been cretaed through a cooperation between Regione Lombardia and the e-mapping unit of Assimpredil-ANCE (Union of Developers and House Builders). A dedicated technical staff first conceived a standard poll form, including the 45 fields of the alphanumerical database. Fields include geographic and cadastral data, territorial context information (among which accessibility and proximity to transport networks), data and evaluations on the state of the buildings (volume, building typology, state of preservation, architectonical value…) and, if necessary, on the state of pollution and/or reclamation of the site.

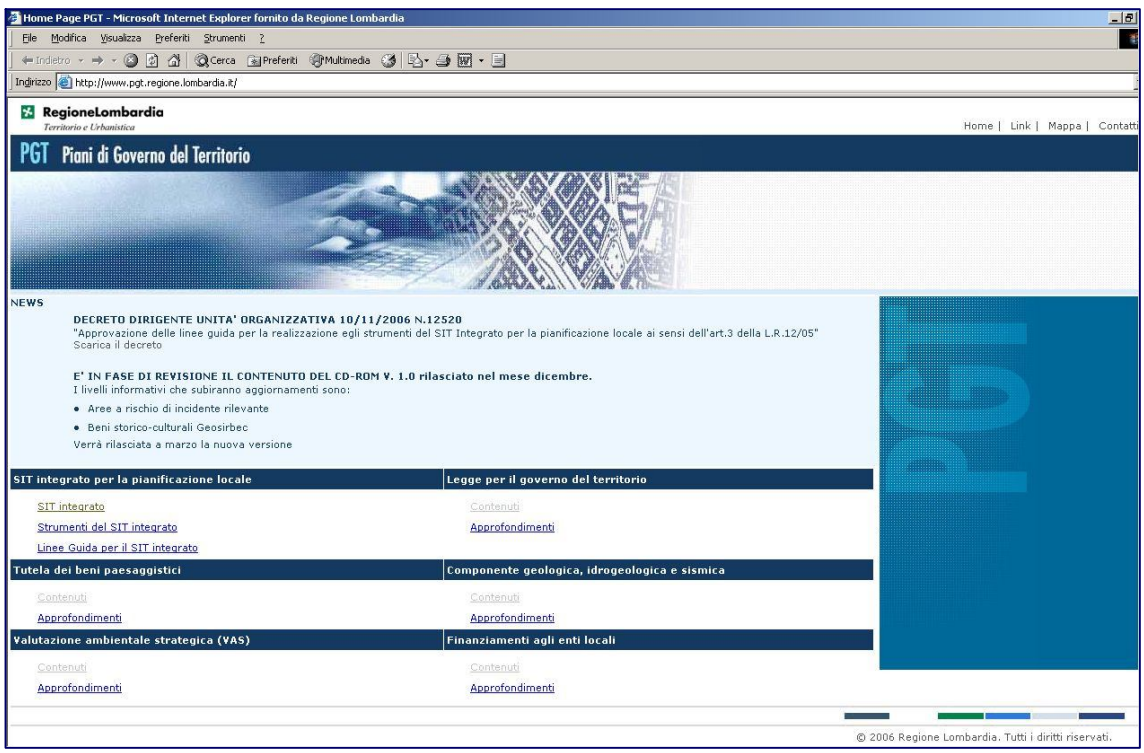

Figure 2. Homepage of the website www.pgt.regione.lombardia.it

Each brownfield site is represented by a polygon in an ESRI-based GIS project and can be viewed, on a selected topographic base, through the same webGIS visualiser as the one supporting the geodatabase for urban planning.

At the moment of writing (September 2008), the geodatabase includes 139 records obtained from 83 urban administrations. As a whole, 250 urban administrations have been polled, 155 of which do not host brownfields, while for 12 administrations the poll is still in progress.

3 WORKFLOW

While making their territorial plans, the urban administrations download the "A-type" spatial data themes from the "Catalogue", updating and correcting them whenever necessary, and if such modifications are permitted (Fig. 3); they create the "B-type" spatial data themes (e.g., urban development areas) and synthesize all the necessary layers to construct the PPP, which in turn implements the urban planning geodatabase; they implement the digital repository with information about the administrative acts and procedures, inherent to the plan and to the related SEA; they eventually deliver the whole plan, in file format, to have it uploaded in the attachment area of the digital repository.

The spatial data theme relative to the brownfield geodatabase has to be verified, if available at regional or provincial level ("A-type"), or created, if not available ("B-type"), by each urban administration.

Since the PPP expires five years after approval, the workflow assures a periodical updating of the urban planning data, including those on the brownfield sites, by the urban administration themselves.

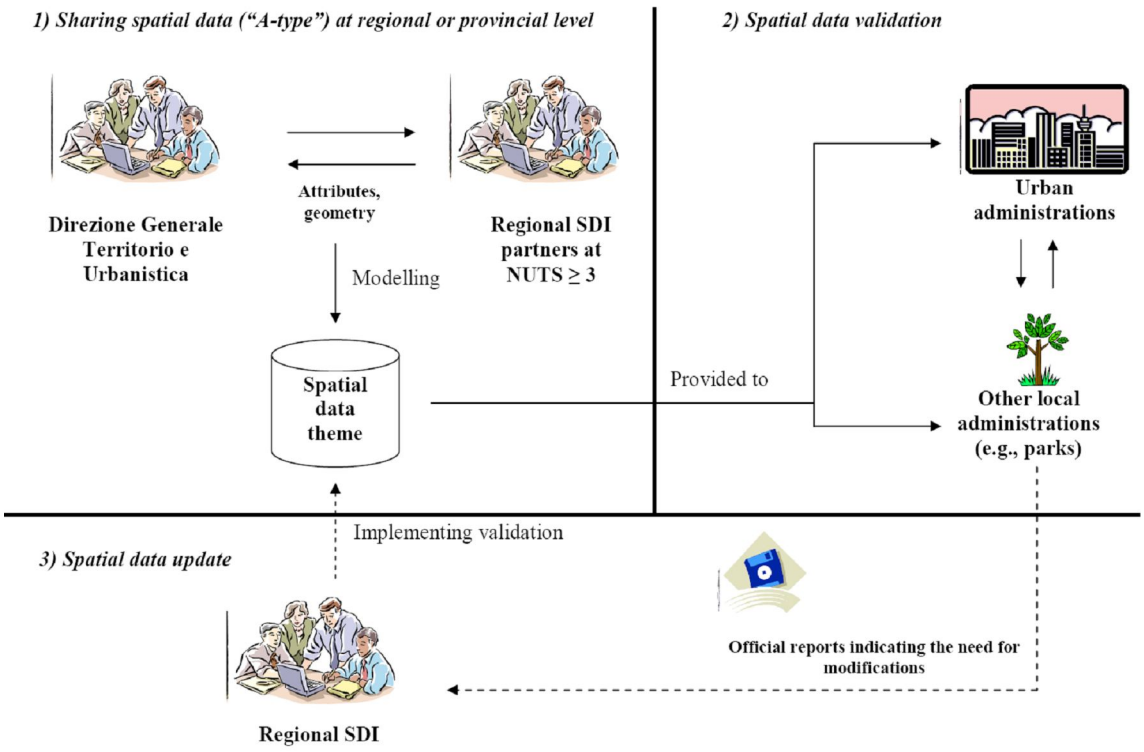

Figure 3. Synoptic view on the workflow for the sharing, validation and update of "A-type" spatial data

4 CONCLUSIONS

The benefits obtained through the tools and the workflow described above are evident, both in a perspective of standardisation of spatial data at the regional scale, and in terms of conti-

nuous updating of the shared reference spatial data themes; contemporaneously, the digital repository tool represent a solid step towards dematerialisation of the administrative acts, as requested by the Italian Digital Administration Code (Repubblica Italiana, 2005).

At the moment of writing, over 50% of the 1546 urban administrations in Lombardy have started the procedure that will lead them to have a digital urban plan approved; 68 among them have already completed the procedure. While supporting the "pioneering" urban administrations, the regional SDI staff was able to calibrate the functions of the urban planning SDI tools according to the end-user needs, and to clarify critical points that emerged in the course of the work. For example, early experiences with the town of Bovisio Masciago (NUTS 4) and with the Brescia provincial administration (NUTS 3) allowed the regional SDI to appraise which spatial data, among those of interest, might have been actually implemented by the vast majority of end-users, and how such data should have been better conveyed to the regional SDI taking into account common technological limitations (e.g., network capability); practice with other urban administrations (Monza, Vailate) resulted in an enrichment of the reference tables (anagraphics) of the geodatabase by including further, or more specific, land use categories.

As a whole, the initiative represents one of the most important achievements in the field of e-government obtained by Regione Lombardia up to now.

The brownfield geodatabase represents also an example of effective cooperation between public and private in the management of spatial data. Assimpredil-ANCE has been the first subject of private right to subscribe a participation protocol to the regional SDI of Regione Lombardia. The activities described above have taken place in the framework of the statutory missions of both subjects, with no explicit charges on any of them.

Data management and exchange have been facilitated by the sharing of a common ESRI platform, but the employment of shapefiles as standard data formats will ease the participation of other subjects, operating on the remaining nine Lombardy provinces, even if they will have adopted different GIS software.

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