Integration of Fiscal Cadastre and the Regional Council of Engineering and Agronomy of the State of Paraná – Cascavel's Pilot Project – State of Paraná

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Key words: Multipurpose Cadastre; Territorial Management; Territorial Information Systems

SUMMARY

According to the Brazilian constitution, the municipalities are responsible for managing taxation on urban real estate properties. However, tax management in Brazil lacks legislation norms to determine standardized technical criteria for the organization of the multipurpose cadastre in urban areas. Consequently, misunderstandings emerge regarding cadastre concepts, disseminating inefficient cadastre systems unable to provide real telling data of their respective territories. Hence, it is necessary to develop and implement a multipurpose cadastre in the Brazilian municipalities containing information related to different areas of interest, with a view to facilitating a comparison of data and information exchange. CREA-PR's GIS – Geographic Information System of the Regional Council of Engineering and Agronomy of the State of Paraná – was planned to cater to different demands and aid both planning and decision-making processes regarding strategic issues of the Council. It is used in the management of the actions implemented by CREA-PR, especially those related to inspection and registration of professionals and companies by means of the visualization of their geographic distribution. This paper aims to present preliminary results of the methodology under development from the integration of Cascavel's fiscal cadastre, the State of Paraná, and the inspection by the Regional Council of Engineering and Agronomy in the State of Paraná – Brazil, through CREA's GIS. This paper also seeks to highlight the importance of such integration in urban tax management to serve as a pilot for other municipalities in Brazil.

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1. INTRODUCTION

The Brazilian government has recognized the advantages of implementing a multipurpose cadastre considering the lack of public policies for the consolidation of a registration culture in the country. In the past years, the government has been developing programs focusing on qualifying municipal public agents. The onset of this initiative is the dialogued production with the community, aiming at establishing national standards for the Multipurpose Territorial Cadastre, in accordance with the Ministry Decree 511/2009. According to this decree, the multipurpose territorial cadastre is defined as an official and systematic territorial inventory of a municipality and it is based on gathering data of the boundaries of each parcel, which receives an accurate numerical identification.

Despite the fact that Brazil has been walking toward the implementation of a cadastral model based on cadastre and property registration, the country still lacks a public and official organ legally responsible for the cadastral mediations. To date, there is no public, unified, standardized, multifunctional, and modern cadastre containing all the urban properties' technical, legal, and graphic data. Also, the country lacks qualified personnel with technical, theoretical and practical expertise, regarding the main methods of topographic survey related to the organization and function of the graphic and descriptive registers, as well as the application of technical and legislative norms of survey, update, and registration of the different aforementioned issues. Moreover, Brazil lacks technical norms for such purposes in urban areas (HASENACK, 2008); (FIG, 2006).

The United Nations – ONU and The International Federation of Geometricians – FIG suggest in Borgor Declaration about Cadastral Reform in 1996 that the spatial cadastral model

(usually a cadastral mapping) should be the plan of fundamental information into a SDI (Spatial Data Infrastructure), thus allowing for the integration of spatial data in different forms (UNITED NATIONS/FIG, 1996). In Brazil, the National Infrastructure for Spatial Data – NISD – was instituted by Presidential Order 6.666, 11/27/2008.

In this context, this article aims to present the implementation of a data distribution structure in a multipurpose cadastre applied to urban areas. The present study proposes the structuring of data and metadata, allowing its analysis from geoservices according to the form proposed by OGC (Open Geospatial Consortium) through web mapping applications, in order to integrate with municipalities' administration cadastre. Due to the fact that this is still a theoretical work in its elaboration stage, we hereby present a structuring proposal for cadastral cartography: Standardization of data, metadata, and geoservices specifically for urban territory cadastre.

Cascavel's government hired a specialist in real estate venal value and urban real estate property tax management to update the venal value and reform the city's revenue and taxation code in cooperation with municipal technicians. Several cadastral inconsistencies were found as regards territorial tax management.

In May, 2010 another specialized service was hired by the city hall in order to elaborate a diagnosis of the Multipurpose Territorial Cadastre – MTC. The report pointed out the main problems related to the cadastre and proposed a prognosis of action. The reforms were based on guidelines put forward by the Ministry of Cities which establishes the goals for the creation, institution, and update of the Multipurpose Territorial Cadastres for the Brazilian municipalities. Also, these reforms were based on the Federal Decree 6.666/2008, which regulates NISD.

Since then, the Urban Planning Secretary has been developing a project named Cascavel Geoportal (http://geoportal.cascavel.pr.gov.br/geoportal/). The project seeks to speed up the administrative procedures, providing cadastral, process, and taxation information, as well as records from other sectors of the several municipal secretaries. With this product, it is sought to provide public managers and citizens with important information on the parcels. By making these data available on the internet, it will make it easier for

citizens to access them, so that they will not need to contact the city hall to obtain them anymore (which is today a time consuming process due to its analogical nature). Some of the data might be visualized by any person anywhere in the world, which may have an impact on the municipality's economy and population.

In August, 2010, a technical cooperation agreement was established between CREA-PR (Engineering and Agronomy Regional Council of Paraná State) and the municipality of Cascavel in order to ensure mutual cooperation between the parties, placing a special focus on site inspection in the Cascavel jurisdiction (Figure 1). The agreement also intended to regulate the mutual information provision regarding the regulating norms to each party to ensure their effective execution.

This paper is aimed at presenting preliminary results of the methodology under development from the integration of fiscal cadastre of Cascavel, State of Paraná, and the inspection by the Regional Council of Engineering and Agronomy of the State of Paraná – Brazil, through CREA's GIS. This paper also draws on the importance of such integration in urban tax management to serve as a pilot study for other municipalities in Brazil.

Figure 1: Location of Cascavel

2. THE REGIONAL COUNCIL OF ENGINEERING AND AGRONOMY

In the 1930s, Brazil went through an intense political and economical transformation. At that time, Brazil suffered a coup d'état, which eventually ousted the President Washington Luís and put an end to the Old Republic. In the economics, the industrial, administrative, and economic modernization represented a fruitful period for the national Engineering. In this context, the Federal Government established an instrument for the inspection and regulation of Engineering in 1933, which was a necessary measure to eradicate unqualified professionals.

The Federal Government, by means of the Federal Decree 23.569, 12/11/1933, regulated the professional execution of Engineering, creating the Federal System for the control of the professional execution of engineers, architects, surveyors, and geographers. The system is composed of a central organ that coordinates other regional organs in all federative units in the country.

In order to improve the federal system, the Federal Law 5.194 replaced the Federal Decree in 12/24/1966. Today, this law rules this system and determines the composition and the legal terms of the federal autarchy for the central organ called CONFEA – Federal Council of Engineering and Agronomy – and the subordinate organs, CREA's – The Regional Councils of Engineering and Agronomy.

CREA-PR, founded in 06/11/1934, is the responsible autarchy for the regulation and inspection of companies and professionals in the fields of Engineering and Agronomy in the state of Paraná. CREA-PR has 35 Inspectorates spread over the cities in the state of Paraná. The inspectorates are grouped into 07 Regional branches (Figure 2), which facilitates the services offered to professionals and companies that are part of the CONFEA/CREA's system.

Figure 2: CREA-PR's Regional branches and Inspectorates

3. CONSTRUCTION SITE INSPECTION

The municipal administration is responsible for site inspection, being in charge of regulating the control and the use of urban land. The Federal Constitution of 1988 states that the city hall is in charge of administrative policing to regulate, control, and inspect all kinds of constructions (residential, industrial, and commercial). The City Statute (Federal Law 10257/2001) establishes the creation of the Director Plan, allowing city halls to apply sanctions when the laws on land control and occupation and environmental norms and standards are not obeyed. As a consequence, this measure prevents constructions in hazardous areas and establishes specific parameters for constructions.

Site inspection occurs through licensing, which is a process in which the city hall may or may not grant land owners the right to construct on their land. The license is granted by means of an official document called Construction License. At the end of construction, and after approval and inspection by several organs, there is still another official document to be obtained called Habitation License. This document is only granted after the inspection by a technician, who needs to confirm the integrity of the construction and the compliance with the respective previously approved construction project.

Many municipalities in Brazil face difficulties with the inspection of their lands. Hence, the integration of information between municipal administrations and CREA-PR may fill this gap and effectively implement the multipurpose cadastre.

3.1. CREA-PR's Inspection

According to the Federal Law 5.194/66, article 1, constructions/services inspected by CREA-PR require the involvement of a professional from the field of Engineering and Agronomy:

"Article 1 – The Engineering and Agronomy professions are characterized by executions of social and human interest related to:

a) Good use and utilization of natural resources;
b) Means of transportation and communication;
c) Constructions, services, and urban, rural, and regional equipments as regards their technical and artistic aspects;
d) Installations and means of access to coasts, courses, and water masses and terrestrial extensions;
e) Industrial and agricultural development".

The main goal of the inspection made by CREA-PR is to verify the professional practice by Engineering and Agronomy professionals, on higher education and technical educational levels, in order to assure the execution of technical services or constructions with

the participation of a licensed professional, observing compatible ethical, economic, technological, and environmental principles to meet society's needs.

As for the activity of inspection per se, inspectors use the following equipments: Tablets to gather computer data, GPS and satellite navigation systems, digital camera and cell phone, which allow the access to the Council's database and secures the data. All of the procedures are taken observing the guidelines determined by the department of planning and the department of inspection control.

4. GEOGRAPHIC INFORMATION SYSTEM OF CREA-PR

Due to the decentralization of tasks, it was necessary to implement a helping tool to provide a more dynamic management with the geographic distribution of the tasks. In turn, this has brought about a better direction to the consolidated actions or those plans under development at CREA-PR, that is, a Geographic Information System (GIS).

CREA-PR's GIS began its operations in March, 2009, when studies were carried out on the Council's needs as regards this tool. Then, the next step taken was to choose the type of technology to be employed during the implementation of that system.

Officially launched in June, 2010, CREA-PR's GIS was developed on a web environment (http://creaprw16.creapr.org.br/sig_homepage/), which can be accessed by means of a portal. Information is displayed by theme maps that permit users to interact through a layered activation/deactivation tool, zoom in and zoom out scales, to gather information based on selecting an element on a map, and printable/exportable maps.

The outcomes of CREA-PR's SIG have helped the inspection process, providing relevant and useful data in the planning of inspecting actions, as well as the visualization of inspections that have been done, since *in loco* inspection collects GPS coordinates (latitude, longitude). In turn, those coordinates show inspected and uninspected areas by inspectors (Figure 3).

Figure 3: Visualization of inspected and uninspected areas

5. DEVELOPMENT

In Brazil, the Decree 6.666 was passed in November, 2008, establishing the National Infrastructure for Spatial Data (NISD). NISD aims to promote the adequate organization in generating, storing, accessing, sharing, disseminating, and using geospatial data as regards the federal, state, district, and municipal spheres (BRASIL, 2008).

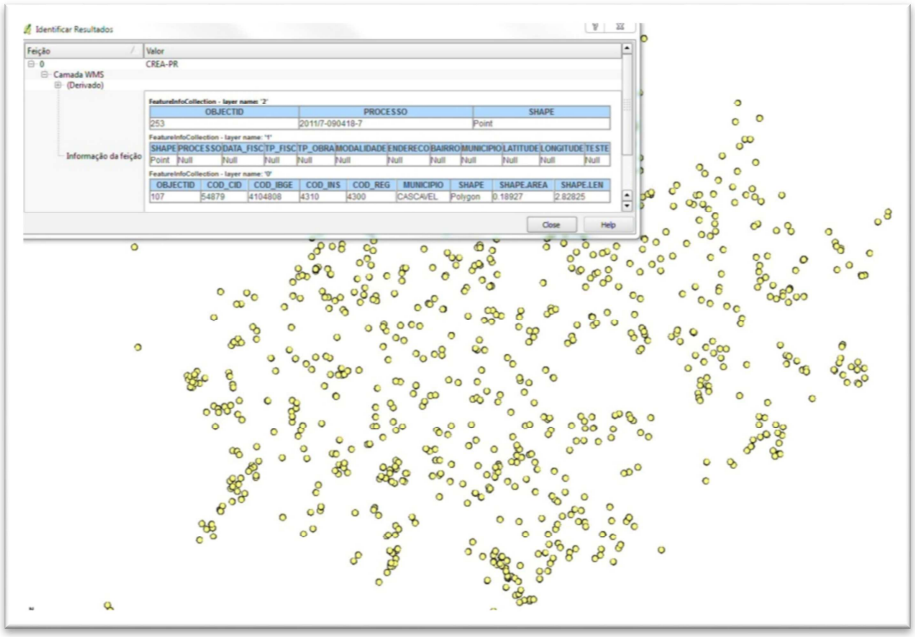
Among the standards defined by OGC, it is possible to mention: a) WMS (Web Map Service), which is a service that allows visualizing and consulting the entities shown on the

vectorial map. It also allows superposing vectorial data to matrix data in different formats and reference systems of coordinates and projections situated in different servers. The WMS petitions could be done by a standard browser in URLs form; b) WFS (Web Feature Service) allows the user to access, consult and even modify (to insert, update, and eliminate) all attributes of a geographic phenomenon represented in vectorial format; c) WCS (Web Coverage Service) refers to a file or a data group on a matrix format, used to represent phenomenon with continuous spatial phenomenon. The WCS service makes it possible not only to visualize matrix format data, but also to consult the numeric value associated with each pixel; d) CSW (Web Catalog Service): is a service specification of OGC that permits the publication and access to digital catalogues of metadata, geospatial data and services, as well as other resource information (IGN/IDEE, 2008, as cited in INDE 2010).

The first tests were carried out through map servers, with remote access to WSM format. In this experiment, it was possible to perceive that the reference system used by CREA's SIG was Ellipsoid GRS 1980, DATUM WGS-84, and Geographic Coordinate System. The reference system used by Cascavel Geoportal was Ellipsoid GRS 1980, DATUM SIRGAS 2000, and UTM 22S Coordinate System.

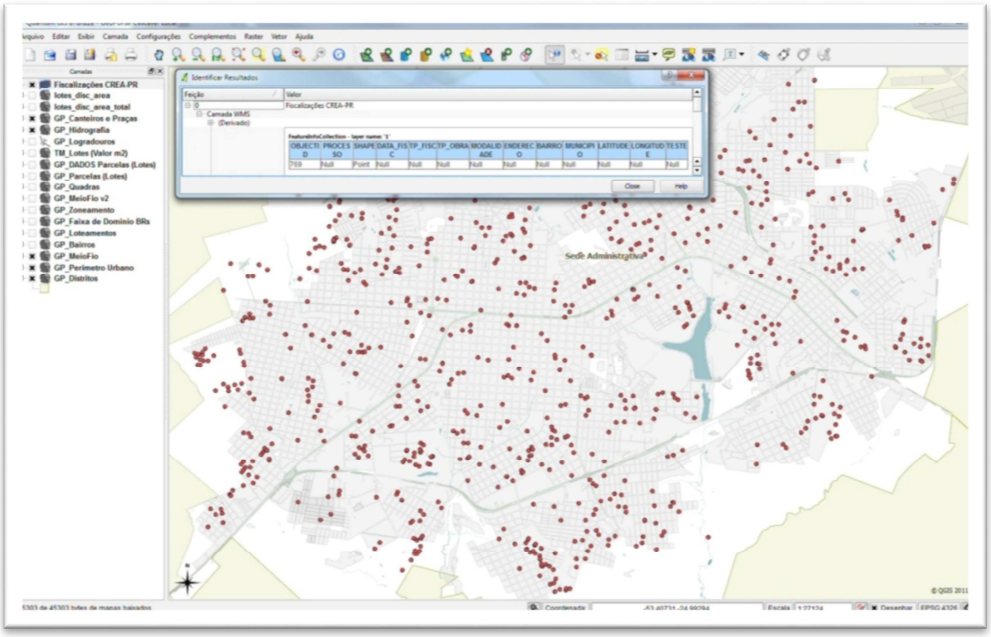
Figure 4 presents the first connection test with CREA-PR's map server. The figure also shows the inspected constructions represented by dots and the database containing the data gathered by the inspector.

Figure 4: Access to CREA-PR Geoservice



The first measure taken was to compatibilize the reference system and the cartographic projection system. In doing so, it was possible to integrate CREA-PR's SIG data and the data retrieved from Cascavel's database. Figure 5 presents the data confrontation retrieved from the cadastral database and the areas inspected by CREA-PR. QGIS, which is free software, was used for that.

Figure 5: Data confrontation



After data superposition, a positional difference was observed in terms of the point provided by the WMS service and the polygon of the correspondent parcel, which made it more difficult to analyze and correlate the data.

Hence, another type of access to CREA-PR database was developed, in which the best solution would be to create a WebService so as to integrate the data from the city hall's management system database and the Council's. WebService is a solution used in the integrations of systems and the communication among different applications. With such technology it is possible for systems developed in different platforms to be compatible. WebServices present an architectural structure that allows for the communication between the applications. A service can be remotely invoked or utilized in order to compose a new service along with other services. The type of technology involved in WebService is based on eXtensible Markup Language (XML) and it makes it possible to invoke or reutilize a service without having to recognize the platform or programming language used in its construction (HANSE, 2009).

For the effective integration between the systems, a definition of the key-field would be necessary. In other words, there would have to be a common piece of information in both databases. In this case, the information chosen was the parcel's cadastral identifier, which on

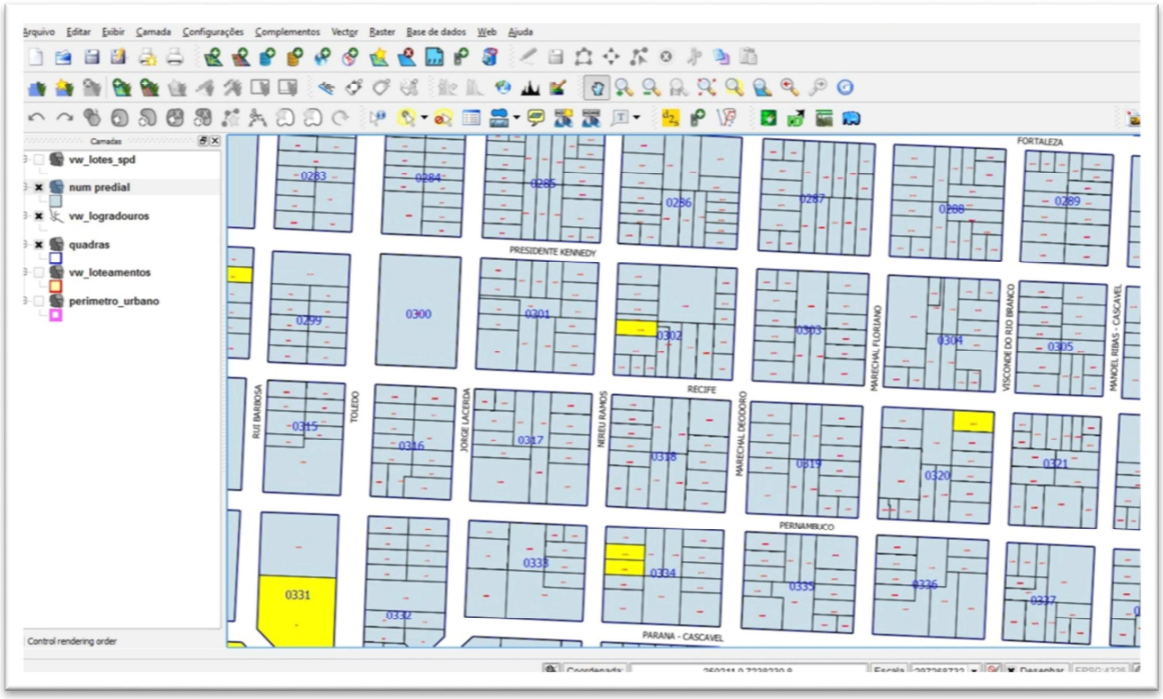
Cascavel's database consists of the numbers related to subdivision/block/parcel. In this sense, the use of an accurate cadastral identifier is the primary component in the implementation of a multipurpose cadastre.

Once the key-field was determined, it was possible to directly relate the information derived from CREA-PR's inspection and Cascavel's cadastral database, thus eliminating the problem with the positional difference in the data.

By means of WebService, the data derived from CREA-PR's inspections are then part of Cascavel's cadastral database, which then becomes source of data for Cascavel Geoportal, therefore generating supporting maps for the city hall to perform the necessary inspections.

As for Cascavel Geoportal, it is important to highlight that the city hall's inspectors can check the information related to the construction, the technicians responsible for that construction, the existence of a construction license legally issued by the city hall, and other relevant data gathered *in loco* by CREA-PR's inspectors. Figure 6 shows an instance of product derived from Cascavel Geoportal, indicating constructions under development that do not have a construction license.

Figure 6: Indication of lack of construction license



6. FINAL REMARKS

Taking into account the fact that CREA-PR's inspection is considered one of the most efficient and respected inspection procedures in the state, this pilot study demonstrated that the information gathered by CREA-PR's inspectors is vital in order to complement the inspection work performed by the city hall.

The integration of the fiscal cadastre of Cascavel's city hall and CREA-PR's database can make it possible to provide a more efficient planning in terms of the inspection procedures carried out by the city hall. Therefore, the integration can allow the inspector to prioritize their actions at construction sites that present evidence of unconformities previously identified by CREA-PR's inspection.

The results generated by Cascavel Geoportal, based on CREA-PR's data, provide a direct support for the inspection planning by the city hall. Through spatial distribution, the results may indicate the areas that are more critical in the city, that is, the areas with a higher index of identified irregularities.

When using the maps on Cascavel Geoportal, it is possible to organize and direct the city hall's inspection teams, which can result in a smaller number of technical staff involved with the inspection process. Consequently, it can also reduce the amount of money spent with the inspection process as in its entirety.

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