The georeferencing of public real estate in the Brazilian geodetic system for the purpose of incorporation into the multipurpose technical registry: building real estate regularization in municipalities

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ABSTRACT

Public assets are, by nature and origin, a property of the cities, but they were left out of Brazil's technical registries, since the purpose was tax revenue. This resulted in a sparse updating of the information regarding the boundaries and perimeters of public assets throughout history. This paper highlights the importance of using georeferencing of real estate in the Brazilian geodetic system - Sirgas 2000 – to survey the dimensions of the real estate, with the goal of integrating the information into the Multipurpose Technical Registry (*Cadastro Técnico Multifinalitário* – CTM) that Brazilian cities are implementing. This article will also present the relevance of registering the updates performed in the public areas in the Real Estate Registration Notary Offices (*Cartório de Registro de Imóveis* – CRI). The methodology employed was the existing Brazilian bibliography about the CTMs and the CRIs, as well as the case studies on the subject from several authors. Finally, it must be emphasized that there is the need to include the information on real estate assets into the CTM technical registries, aiming for centralization, control and transparency of public expenditure.

Keywords: Georeferencing. Public assets. Brazilian geodetic system. Multipurpose Technical Registry.

1. INTRODUCTION

Based on the refinement of the geodetic techniques, the new technologies, and the importance of preservation of public property, the need arose to locate and delimit the public assets of cities in a more accurate way, using, to that end, the georeferencing of real estate properties.

By applying topographical knowledge and the planimetric survey techniques, the relevance of spatially representing objects by creating georeferenced polygons is made clear. In a simple and concise way, the goal is to demonstrate the importance of accurately knowing, delimiting and locating public real estate properties, seeking to promote the incorporation of this information into the cities' Multipurpose Technical Registry (CTM).

In the last decades, public agents have invested in equipment and real estate properties to meet the population's needs and to provide services. This has significantly increased the cities' real estate property, thus generating new assets that do not always have real estate registrations that are assertive or updated regarding their boundaries and location.

The Real Estate Registration Notary Offices (CRI) have, in some cases, received and stored imprecise information, such as distance measurements in "steps or spans", which, throughout Brazilian history have been replaced by the measurement unit in meters, of the International System of Units. It also happens that many registries were updated without a very precise assessment by the municipal bodies, which may lead in the future to the overlapping of private real estate property registrations and public lands, possibly causing discussions and disputes.

We recommend adoption of a CTM that involves a single registry of public and private assets making it possible to verify if there is overlapping of real estate property registration or irregular occupation, thus opening the possibility of filing administrative appeals to challenge registrations at the CRIs or finding quicker legal interventions.

This paper is supported by the Brazilian Legislation which addresses the georeferencing of real estate property in the Resolution nº 01/2005 of the Brazilian Institute for Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* – IBGE). This resolution altered and defined the new Brazilian geodetic system. This research also borrows from The Civil Code of Brazil, which details assets considered public. However, there is no norm or rule that also determines the application of georeferencing to state-owned lands and properties. To study this theme we also take into account Ordinance nº 511/2009 of the Ministry of Cities - which addresses the guidelines for creating, establishing and updating the CTM in Brazilian municipalities -, as well as the works of scholars who address the issue at

hand, such as Carneiro (2003), Pimentel (2012), Erba (2005) and others.

2. DEVELOPMENT

To promote public management, the municipality must know its territory beyond its geographical boundaries. Moreover, for the optimization of resources, it must consider surveying of the public properties, such as squares, rivers, public addresses, hospitals, government buildings, daycare centers, health centers or any property that is registered by it or in its possession.

In the past, to locate a property, it was necessary to read its property registration or descriptive memorandum to get to know its dimensions and areas. In the end, this would lead to a field survey to assess the measurements, which do not always match the expectation. Furthermore, in these registration documents, there is also the description of the adjoining properties. If the registration is very old, those may not describe the property or the adjacent land, but rather mention the name of the adjoining landowners or reference the local geography, like mentioning rivers, lakes, seas, hillsides and mountains.

In addition, the use of addresses, description of the terrain and adjoining landowners names does not contribute in the long run to the correct and accurate localization in case there are building removals, new constructions, or change of ownership, not to mention the fact that the public properties may be the target of unlawful occupations and third party property damage.

Georeferencing arose to solve this problem, reduce disputes and increase the accuracy in property localization. The term can be defined as the act of "describing and determining the location of a property through topographical survey, with precision equipment used by specialized professionals" (GEORREFERENCIAR, 2015, our translation).

This technique consists in representing, by means of polygons in a given standard reference system, the perimeter of a property based on its location coordinates, with the purpose of incorporation into the CTM. Afterwards, this information can be object of overlapping and comparison with the other public records or serve for rectification of property documents in the CRIs.

According to Zocolotti (2005), a polygonal represents a series of consecutive lines with known lengths and directions, which are obtained through field survey. The researcher also notes that "The survey of a polygonal is performed through the traverse method, which involves going through a path's outline defined by a series of points and measuring all angles and sides and an initial orientation" (p. 10, our translation). It is recommended to use closed traverses, since the starting and ending points should be at the same coordinate to calculate the area of public properties.

From February 2005 to February 2015, it was allowed to use simultaneously the Geocentric Reference System for the Americas (Sirgas 2000), the South American Datum 1969 (SAD 69) and Córrego Alegre, and there was support from the country's legislation for technical works using property georeferencing.

With the growth in the use of this tool in Brazil, these reference systems were used for the performance of several surveys, besides being taken into consideration for the CRIs registrations. In the future, this may lead to disputes if the property registrations do not have the information about the reference system in the previous property title documents. Not knowing the reference system employed implies the incorrect localization or polygonal displacement.

Since February 25, 2015, Sirgas 2000 is recognized and officially employed for georeferencing. This is set forth in a Resolution of the IBGE Presidency, which also elucidates:

> For the development of geodetic activities, it is necessary to establish a geodetic system that serves as reference for positioning in national territory. The materialization of this reference system, through geodetic stations properly spread across the country, is established in the reference infrastructure from which the new positionings are performed. (BRASIL, 2005, our translation).

According to Erba (2005, p. 25, our translation), "The problems derived from the relative localization disappear when the absolute positioning of the properties is employed. In this system, each detail surveyed gets a coordinate matching a unique reference system, whether municipal or national". Thus, the registry survey measured by coordinates and a unique reference system contributes to the property localization, besides comparing existing property registration with the actual reality of things.

According to Carneiro (2003), information surveying and the resulting registry have, in Brazil, a focus on taxation that mostly disregards the party with no tax interest, such as the public areas in this case study.

Considering that this author sees the municipal registry as a tool that should go beyond the tax aspect and that must participate in planning, urban control and spatial planning, we highlight:

> The multipurpose registry is defined by Dale & McLaughlin (1990) as a spatial information system designed to serve both public and private organizations, as well as serving the citizens. It differs from the other spatial information systems because it is based on plots. It serves as a basis for the other types of registry (legal, fiscal etc...) (CARNEIRO, 2003, p. 24, our translation).

Erba (2005, p. 21) is in line with the idea of a land registry in the cities and demonstrates this in a statement by the International Federation of Surveyors as follows:

> FIG's Statement on the Registry is in accordance with this last affirmation when it asserts that the Registry is a land information system, normally plot based, that records interests in land, such as rights, restrictions and responsibilities. It also adds that the Registry may be established for fiscal or legal purposes and/or to support planning, always seeking economic and social development. It highlights, however, that there is no need to think about a uniform Registry for all countries or jurisdictions.

The registry of public areas should follow the pattern of other Brazilian technical registries. Considering the guideline from the Infrastructure for Spatial Information in Europe (Inspire), it must possess at least the following information: "plot geometry, sole identifier, geodetic reference and index of the plots for printing/publishing" (PIMENTEL; CARNEIRO, 2012, p. 210, our translation). In this aspect, by creating a registry of public areas, those should be able to be integrated into the other municipal registries that also possess these data.

To promote understanding of the matter, the concept of registry plots defined in Ordinance 511/2009 is adopted. This Ordinance, which addresses public assets, is transcribed below:

> Art. 2. A registry plot is the smallest unit of the registry. It is defined as a contiguous portion of the surface of the land with a single legal system.
>
> Paragraph 1. Registry plot is all and every portion of the municipality surface that will be registered.
>
> Paragraph 2. The other units, such as lots, public roads, squares, lakes, rivers and others, are modeled by one or

> more plots mentioned by the head of this article, identified by their respective codes.
>
> Paragraph 3. A single and stable code shall be assigned to every plot.

In its third article, this abovementioned Ministry of Cities Ordinance explains that "all and every portion of land surface must be registered in plots". This refers us to start from the legislation regarding composition of a CTM that, depending on the situation, may require public area plots to be registered through one or more plots - or whatever provides more transparency and suits the preference of the party performing the registry –, and these plots must be identified by unique codes.

According to Pimentel and Carneiro (2012, p. 205, our translation), the International Federation of Surveyors clearly depicts the matter of composing the registry information:

> According to the International Federation of Surveyors (FIG, 1995), the plot is the smallest unit of land of the registry, and it can be defined in several ways depending on their purpose for the registry. For example, an area with a specific land use, an area of exclusive control, or a property owned by an individual or group of individuals. The boundaries can be formal or informal and, for the identification of the polygons, a unique code is used.

This author also recommends that any registry of land plots must be multipurpose and use standardization, as he states in the following words:

> It is suggested that plot surveying should be georeferenced to the Brazilian Geodetic System for unequivocal identification of its boundaries. The UTM conformal projection is recommended until a specific projection is determined for large scale cartography. (loc. cit., our translation).

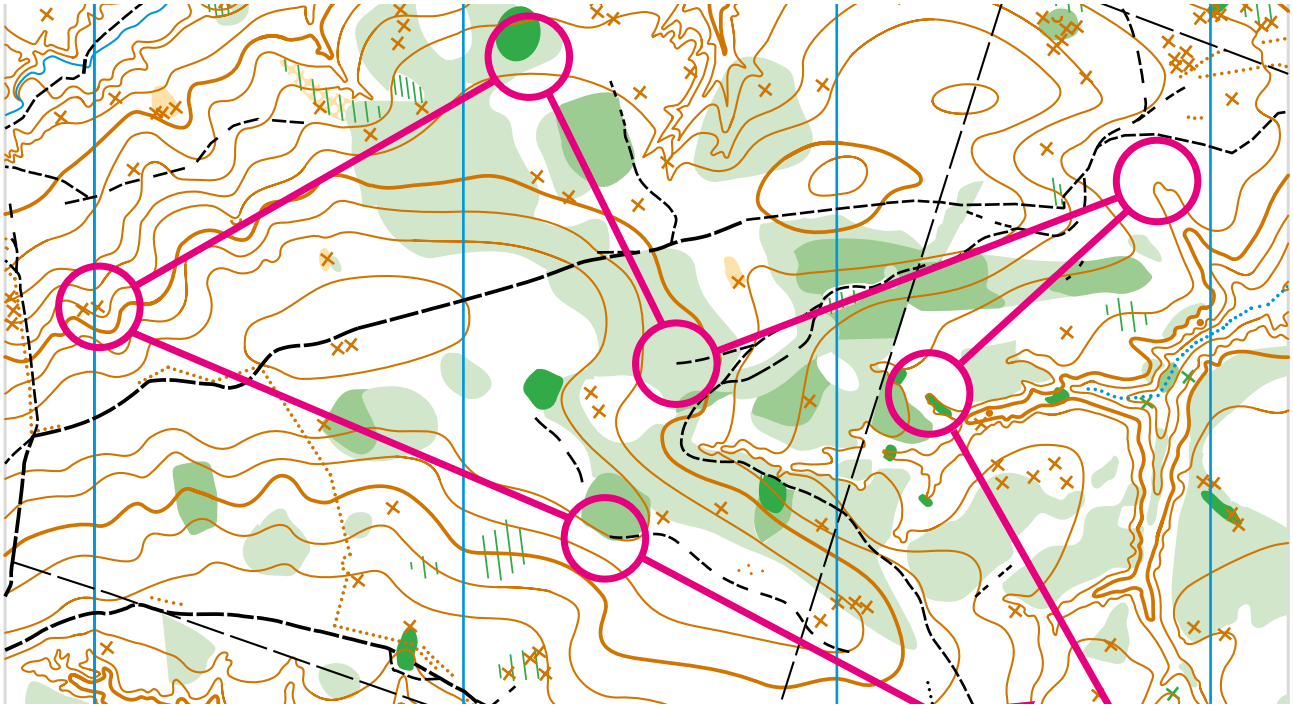
In Fonseca's (2010, p. 14) view, one of the goals of creating a CTM in a municipal context is also developing a public patrimony registry, which he describes as "an inventory of the properties that belong to public patrimony".

This same author highlights that, for a registry to be multipurpose, it must fulfill a social role, because "Nowadays, there is already a wider and more diverse meaning to registry, which showcases its important social role due to the various information it may contain, lacking only the taxation role, thus being considered multipurpose" (loc. cit., our translation).

In his thesis, Galdino (2006, p. 56) also emphasizes a concern about the registry in plot form, since this format must preserve other characteristics typical of the Brazilian legislative legal system, which implies the need for adaptation of the public surveying of public properties in this regard. The author also addresses the responsibility of territorial authorizing officers regarding the observation of property rights and restrictions, whether in a rural or urban environment, which he points out as follows:

> Here in our country, a plot-based land registry that takes observes the urban or rural property rights, restrictions and responsibilities - in management, economic, legal and geometric aspects – is only currently being interactively discussed by institutions, the public authority, and the scientific community, particularly according to the FIG models and adapted to the country's reality. However, it is necessary that the institutions and scholars explicitly persevere in their inclusion in specific legislation, appointing the institution in charge, rules, and regulations. (loc. cit., our translation).

When delimiting and registering a city's real estate properties, it is also possible to work on land re-



gularization, as Carneiro (2003, p. 25, our translation) points out:

> The work of land regularization consists in a series of technical, legal and administrative procedures (topographic registry and survey, analysis of original ownership of properties, discriminatory actions, demarcations, title legitimization etc.), which have the goal of ending ownership uncertainty by separating the unoccupied lands from the private ones and legitimizing the ownership and use of public lands.

In the case of public areas, other important information should be collected to construct said registry: type of public property, legislation of use and occupation of the property, lot and building dimension, identification of correspondence of the physical boundaries of property to real estate, acquisition cost and property valuation cost, in case there is any.

Public properties have been classified by The Civil Code of Brazil as proprietary, of common use by the people and of special use. Still according to the mentioned Law, in article 99:

> Article 99. Public properties are:
>
> I – those of common use by the people, such as rivers, seas, roads, streets and squares;
>
> II – those of special use, such as buildings or lots destined for service or establishment of federal, state, territorial or municipal administration, including those of their autarchy;
>
> III – the proprietary assets, which form the patrimony of legal entities of public law, as an object of personal or effective right of each one of these entities. (BRASIL, 2002, our translation).

Public properties have a purpose from their acquisition or receipt and should be classified based on their destination. According to Di Pietro (2000 apud CARNEIRO, 2003, p. 99), there is also the need for a separation between own real estate properties, defined in the legislation as special and proprietary, and properties of common use by the people, since the first promote equipment installation and service provision, while the second integrates the patrimony with the purpose of preservation and conservation by the public authority.

According to Carneiro (2003), because updating property registrations is not compulsory and there is lack of interest from the property owners, a dichotomy has been installed between what has been registered in the CRIs and the reality of Brazilian properties, whether public or private. In the case of public properties, they are frequently susceptible to expansion, reduction and incorporation, and there are interventions made

by the municipalities that are often not informed at the CRIs, which leads to the abyss between reality and the property's legal boundary.

According to Haar (1992 apud ERBA, 2005, p. 24), the difference between real boundary and ownership boundary often results in disputes and administrative and legal expenses for the property's defense and reintegration, which is transcribed as follows:

> Regarding the registry, there are two plot boundaries: the legal boundary, defined by Haar (1992) as an imaginary line that cannot be located in the land without an indicator to materialize it, thus requiring the study of the documents of the plot in question and those of the surrounding properties for the boundary's definition; and the ownership boundary, which is determined by the use of the property, materialized by natural or anthropological entities.

Regarding the previous topic, it is wise to report and inform in the registry incorporation act the difference between the legal and ownership boundaries, since these data are not always immediately added in the CRI, for there are rules, expenses and need of approval for the entry of these updates and corrections.

Building on the difference between legal and ownership boundaries, as highlighted by Carneiro (2003) and Erba (2005), it is also important to note that there is no good practice regarding updating information in the CRIs, which require, the payment of fees and emoluments, not to mention the technical responsibility.

In part, this dichotomy between the municipal registry, the property registrations and the properties' reality has created countless consequences for Brazil's real estate historical path, as Erba (2005, p. 25, our translation) explains in a portion of his research, as follows:

> In Brazil, a large portion of measurements carried out by professionals aims only to survey existing facts, thus determining the ownership boundaries of the properties and lacking the knowledge about the legal causes related to the effective property right. This fact ends up causing a generalized and known situation of confusion about boundaries and overlapping of property documents. A weak point of this system is the lack of accuracy caused by the existing subjectivity in the moment in which the aforementioned starting point is determined when the plot is tied to the urban grid. The use of this kind of reference has caused big problems in territorial advertising in many countries, generating overlapping of titles and conflicts of boundaries.

To facilitate the accounting balance of the cities, it is recommended to include, at the time of the registry, the acquisition cost of the property, with the aim of providing convenience and agility in the accountability, as well as making it possible to associate the investments to each patrimony, thus facilitating transparency in the public expenditure.

This need receives the contribution of the Brazilian Accounting Standards Applied to the Public Sec-

tor (Normas Brasileiras de Contabilidade Aplicadas ao Setor Público - NBCASP), incorporated by the Federal Council of Accounting (Conselho Federal de Contabilidade – CFC), which requires from the public spheres an investment accountability, aiming to represent the real value of every public property, which should also be associated to the municipalities' CTMs.

3. CONCLUSION

Brazil is developing its registry culture based on the Multipurpose Technical Registries (CTM), but it still lingers its focus in the tax aspect. In this aspect, the inclusion of georeferencing of public property in the CTMs must take into consideration not only its boundaries and outlines, but also the addition of information regarding the type of property being registered, aiming not only for its delimitation, but adding to the transparency in public expenditure as well.

This paper presented the opportunity to modernize and adapt public property surveys and descriptions in the Brazilian geodetic system, so that it becomes possible to avoid the loss of patrimony with overlapping of third party property registrations and to provide more integration with the Brazilian development platforms.

It is worth highlighting that, in order to protect the public areas, it the possibility of registering them in the same environment as the private areas should be taken into consideration, so that overlapping or incorporation into private patrimony can be avoided. By using this methodology, the municipalities will be able to add other information, such as current investments and use, thus avoiding the waste of State resources.

Brazilian history demonstrates the dichotomy between the CRI's real and legal boundaries. However, property georeferencing must contribute to attest the reality of the properties and serve to update this information in the CRIs, which possess a very important role in property defense.

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