URBAN LAND REGULARIZATION – A CASE STUDY IN MOGI GUAÇU/SP

REGULARIZAÇÃO FUNDIÁRIA URBANA - ESTUDO DE CASO EM MOGI GUAÇU/SP

REGULARIZACIÓN DE LA TENENCIA DE LA TIERRA URBANA – ESTUDIO DE CASO EN MOGI GUAÇU/SP

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ABSTRACT

With population growth, the number of irregular land subdivisions has increased considerably, owing to the formation of subnormal housing, such as *favelas*, but also to a segment of the informal market: clandestine allotments (*loteamentos clandestinos*). The irregular occupation of land brings problems that are reflected in the other areas of service provision of a city; in addition to generating problems for the regularization of land tenure and, consequently, for the right to housing. In order to ensure the constitutional right to housing, as well as its regularization, Brazilian legislation establishes public policies aimed at ensuring these rights. This work presents a case study of urban land regularization, describing the procedures for preparing a regularization project in a clandestine urban settlement in the Municipality of Mogi Guaçu – SP. The data were obtained from an on-site survey (*in loco*) of the existing situation of the location, from municipal proceedings, and through the use of software such as Métrica Topo, Google Earth, and QGIS, and web portals such as DataGeo, for the preparation of the technical documents. With the data collected, the necessary steps for the land regularization procedure were established through the application of the federal law in force, from the first steps to the delivery of the regularization certificate to each landholder (*posseiro*). It was concluded that, with the application of the current Law, there is the possibility of guaranteeing the titling of the property for its occupants and the integration of the informal urban settlement into the urban territory, thus ensuring access to public services that were previously nonexistent.

Keywords: Land Subdivision. Irregular Subdivisions. Reurb.

RESUMO

Com o crescimento populacional, o número de parcelamentos de solo irregular teve um elevado aumento, devido a formação de habitações subnormais, como as favelas, mas, também, a um segmento do mercado informal que são os loteamentos clandestinos. A ocupação irregular do solo traz problemas que refletem nas demais áreas de prestação de serviço de uma cidade; além de gerar problemas para a regularização da posse do

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terreno e consequentemente o direito à moradia. Afim de assegurar o direito constitucional à moradia, bem como sua regularização, a legislação brasileira estabelece políticas públicas que visam assegurar esses direitos. Este trabalho apresenta um estudo de caso de regularização fundiária urbana, descrevendo os trâmites para a elaboração de um projeto de regularização em um núcleo urbano clandestino no Município de Mogi Guaçu – SP. Os dados foram obtidos a partir de levantamento *in loco* da situação existente do local, de processos municipais e com uso de *softwares* como o Métrica Topo, Google Earth, QGIS e portais *web* como o DataGeo, para elaboração das peças técnicas. Com os dados levantados foi estabelecido quais seriam os passos necessários para o procedimento de regularização fundiária por meio da aplicação da lei federal vigente, desde os primeiros passos até a entrega da certidão de regularização para cada posseiro. Concluiu-se que com a aplicação da Lei atual, há a possibilidade de garantia da titulação do imóvel para seus ocupantes e a integração do núcleo urbano informal ao território urbano, garantindo assim acesso aos serviços públicos antes inexistentes.

Palavras-chave: Parcelamento de Solo. Parcelamentos Irregulares. Reurb.

RESUMEN

Con el crecimiento poblacional, el número de parcelaciones de suelo irregulares ha experimentado un elevado aumento, debido a la formación de viviendas subnormales, como las *favelas*, pero también a un segmento del mercado informal que son las parcelaciones clandestinas (*loteamentos clandestinos*). La ocupación irregular del suelo trae problemas que se reflejan en las demás áreas de prestación de servicios de una ciudad; además de generar problemas para la regularización de la posesión del terreno y, en consecuencia, para el derecho a la vivienda. A fin de asegurar el derecho constitucional a la vivienda, así como su regularización, la legislación brasileña establece políticas públicas orientadas a asegurar estos derechos. Este trabajo presenta un estudio de caso de regularización de la tenencia de la tierra urbana, describiendo los trámites para la elaboración de un proyecto de regularización en un núcleo urbano clandestino en el Municipio de Mogi Guaçu – SP. Los datos se obtuvieron a partir de un levantamiento in situ (*in loco*) de la situación existente del lugar, de procesos municipales y mediante el uso de programas informáticos como Métrica Topo, Google Earth y QGIS, y de portales web como DataGeo, para la elaboración de las piezas técnicas. Con los datos recopilados se estableció cuáles serían los pasos necesarios para el procedimiento de regularización de la tenencia mediante la aplicación de la ley federal vigente, desde los primeros pasos hasta la entrega del certificado de regularización a cada poseedor (*posseiro*). Se concluyó que, con la aplicación de la Ley actual, existe la posibilidad de garantizar la titulación del inmueble para sus ocupantes y la integración del núcleo urbano informal al territorio urbano, garantizando así el acceso a servicios públicos antes inexistentes.

Palabras clave: Parcelación del Suelo. Parcelaciones Irregulares. Reurb.

1 INTRODUCTION

The urbanization process, for Roque and Ayoub (2020), occurs through the opening of lots within the urban perimeter and/or outside it, with the carrying out of the technical and legal procedure known as Land Subdivision (*Parcelamento de Solo*).

Land subdivision may be considered the main instrument for structuring urban space, since, according to Mesquita (2008), after its implementation the space created by it will maintain its structure for many years or centuries and will be occupied by various generations of city inhabitants. Thus, for Alvarenga (2007), urban land subdivision deals with the division of the land, in the form of allotments (*loteamentos*) and dismemberment (*desmembramento*). The subdivision is carried out by private initiative, under the supervision of the Public Administration.

The opening of allotments is the most common and significant form of urbanization in Brazil. Leonelli (2010) points out that Brazilian cities expand through the production of lots, in a constant transformation of rural areas into urban ones.

The technical and legal regulation of land subdivision is carried out through urban-planning legislation. Within the universe of urban-planning laws, Barreiros and Abiko (1998) asserted that Federal Law No. 6.766 (BRASIL, 1979) [[nota: números de leis brasileiras mantidos no formato original (com ponto), por serem identificadores de referência; ex.: 6.766, 13.465]] stands out, first because it is the law of national scope that provides for urban land subdivision and, second, for establishing norms and parameters that came to guide and determine new postures in state and municipal legislation.

This law, according to Freitas (2000), in addition to dismemberment, contemplates the allotment, whose execution proves more frequent and of greater impact, since the allotted tract (*gleba*) loses its objective individuality, transforming itself into streets, public spaces, and lots. The lots, for Queiroga (2002), come to have an autonomous life, transmuting themselves into "units autarkically sufficient in themselves," and must have direct access to the circulation routes created by the detailing of the tract.

Federal Law No. 6.766 (BRASIL, 1979) determines that the entire process of project development, legal authorization of the enterprise, and execution of the minimum infrastructure works of the subdivision for the commercialization of the lots is the full responsibility of the developer. Oliveira (2017) states that it is always important to emphasize that the non-fulfillment of any one of these stages is a crime, with penalties provided for in the referred law, which comprehensively outlines all the rules applicable to subdivision projects, such as: project configuration, urban-planning indices, basic infrastructure, documentation, guarantees, registry, contractual, and penal aspects, among others.

Despite this federal law, Conceição and Souza (2018) state that only in 2009 did a legal instrument come to address the question specifically and define the concept of land regularization as: the set of legal, urban-planning, environmental, and social measures aimed at the regularization of irregular settlements and at the titling of their occupants, in order to guarantee the social right to housing. This is undoubtedly the most important milestone of urban land regularization (Reurb): Federal Law No. 11.977 (BRASIL, 2009).

When the subdivision is executed without observance of the legal requirements, it may be considered clandestine or irregular. Lobo (2019) presents that the subdivision termed clandestine is one whose existence is not known to the competent Public Authority, or one that, although brought to the public authority for approval, has no such approval—that is, the request is denied or there is no application for approval at all. The irregular subdivision, in turn, is one in which there is knowledge and/or approval of the allotment project, but the execution of the subdivision is in nonconformity with the act of approval or with the legislation in force.

The disorderly occupation of land, for Freitas (2000), gave rise to the formation of subnormal housing, such as *favelas*, but also to a segment of the informal housing market that continues to grow, consuming the savings of the unwary, degenerating the urban development standards of cities, and often degrading the natural environment: the clandestine allotments.

According to Pinto (2003), clandestine allotments may be promoted both by the owners of the land and by third parties. In the first case, the aim is to escape the procedures and burdens contained in federal, state, and municipal laws, such as the allocation of public areas and the carrying out of infrastructure works. In the second, it is a matter of so-called land "grilagem" (land grabbing through fraudulent titles) [[nota: "grilagem" é termo jurídico brasileiro para apropriação de terras mediante falsificação de títulos; traduzido com glosa entre parênteses]], in which unscrupulous people sell land belonging to others as if it were their own.

Roque and Ayoub (2020) state that such allotments opened clandestinely become a problem for their purchasers and for municipal public managers, thus requiring their regularization after installation; however, Caldas (2009) emphasizes that the procedure for regularizing clandestine and/or irregular allotments is complex, costly, and slow, and at times conflictual.

Among other disturbances caused by the irregular occupation of urban land, Pinto (2003) highlights the following: disarticulation of the road system, hindering the access of buses, ambulances, police vehicles, and garbage collection trucks; formation of

neighborhoods subject to erosion and flooding, silting of rivers, lakes, and seas; absence of public spaces for the implementation of health, education, leisure, and security facilities; compromising of water supply sources and of the water table; clandestine electricity connections, resulting in risks of accidents and fires; excessive horizontal expansion of the urban fabric, causing high burdens on the public budget.

Informal real-estate transactions of unregistered properties do not generate tax revenues for states and municipalities. Roque and Ayoub (2020) observe that the Tax on the "Inter Vivos" Transmission of Real Property and of Real Rights over Real Property (ITBI – *Imposto sobre Transmissão "Inter Vivos" de Bens Imóveis e de Direitos Reais sobre Imóveis*) [[nota: sigla ITBI mantida; expansão e tradução do termo entre parênteses, conforme regra 5]], of municipal competence and which excludes transactions involving unregistered properties, was responsible for collecting around 9 billion reais in the country in 2013, which represented around 10% of the total tax revenues of Brazilian municipalities (FNP, 2014), which reinforces the need for allotments to become regular with the municipalities.

The irregularity of urban occupations, for Ribeiro (2018), shows itself to be a structural problem, demanding the promotion of public policies and legislative solutions so that the administration of this enormous contingent of people in a condition of irregular housing can be carried out. As a form of response to such a question, Federal Law No. 13.465 (BRASIL, 2017) brings the institute of Urban Land Regularization (Reurb), whether of social interest or not, in which the aim was to overcome the obstacles of previous legislation, attributing greater responsibility to the State and extending the list of those legitimated to request the project.

Urban Land Regularization (REURB) is presented by Maux (2017) as the processing that involves legal, urban-planning, environmental, and social norms with the purpose of incorporating informal urban settlements into the urban territorial ordering and of titling their occupants. The legal measures refer to the solution of tenure (*dominial*) problems, regarding situations in which the occupant of a public or private area does not hold a title with due legal guarantee over their occupation.

Ávila and Ferreira (2016) highlight that Provisional Measure No. 759 (BRASIL, 2016), converted into Federal Law No. 13.465 (BRASIL, 2017), provides for, highlights, and orders forms of Land Regularization through two models named: REURB-S, treatment as Social, for those verifiably qualified as Low Income, whose responsibility falls to the municipalities; and REURB-E, treatment as Specific, for those who do not fit the previous principle, whose responsibility falls to whoever has the established right—whether through proof of ownership or by court order—to fulfill and execute all the legal principles necessary for the regularization.

Melem and Santos (2021) explain that, in the case in which the irregular settlement, as ascertained by the socioeconomic survey, is inhabited by residents whose possessor/holder of the property has an income higher than 5 minimum wages—that is, if half plus one of the "heads of household" who possess the properties have a verified income higher than the maximum ceiling of 5 minimum wages—it is defined that the solution will be the application of the Reurb of Specific Interest (REURB-E). On the other hand, likewise ascertained by the socioeconomic survey, if the total quantity of possessors/holders of the existing properties within the area to be regularized exceeds half plus one of the properties inhabited by residents with an income lower than 5 minimum wages, we have the legal configuration for the application of the Urban Regularization of Social Interest (REURB-S), which exceptionally may be applied in informal urban settlements that occupy Permanent Preservation Areas (*Áreas de Preservação Permanente*), unlike Reurb-E, which, in the terms of Law No. 13.465 (BRASIL, 2017), brings no legal provision for such a procedure.

In this context, Conceição and Souza (2018) state that the text of the Law chose the socioeconomic criterion as the preponderant variable in defining which modality of Reurb will serve a given informal urban settlement. That is, the one who defines whether the regularization is of social or specific interest is the municipality, through an act of the executive, based on the socioeconomic condition, which must be assessed by means of a survey.

Despite this, Marrara (2019) stresses that irregular occupations must not be confused with urban land regularization for the needy population. The legislative, theoretical, and practical concern with regularization has increased, since irregular or clandestine occupations of public and private areas, besides resulting from pressing social needs, are also practiced by the middle and upper classes, as well as by economic agents of different sectors. Thus, a high volume of these occupations stems from the desperation of a good part of the Brazilian population, deprived of the minimum financial conditions to access dignified housing spaces and maintain them—not forgetting that a portion of these irregular occupations emerges as a malicious strategy of certain privileged social and economic groups, who employ it with the aim of enriching themselves improperly through the illicit appropriation of public or private goods outside the regular processes of subdivision and of acquisition of possession or ownership.

Melem and Santos (2021) present that, in order to request REURB, the following are legitimated: the Union, the States, the Federal District, the Municipalities, entities of the indirect public administration; its beneficiaries, housing cooperatives, residents' associations, foundations, social organizations, civil society organizations of public interest or other civil

associations; the owners of land, allotters, or developers; the Public Defender's Office (Defensoria Pública) and the Public Prosecutor's Office (Ministério Público). Marrara (2019) points out that Federal Law No. 13.465 (BRASIL, 2017) shifted to the Municipalities, and to the Federal District, the central role in conducting the regularization process. It also defined a legal regime of its own, seeking to congregate the acts in the hands of a single federative entity, with expectations of imparting greater speed to the conduct and conclusion of the regularization. As the process will occur in the Municipality where the area subject to regularization is located, the proximity between the parties and the public institutions tends to increase, so as to facilitate relations, the delivery of documentation, and the resolution of any conflicts, including by amicable and consensual settlement.

Jesus (2018), analyzing the legal provisions of Law No. 13.465 (BRASIL, 2017) and of Decree No. 9.310 (BRASIL, 2018), verifies concerns of a technical engineering order, tied to surveying and legal monitoring capable of identifying the parties directly involved in the Regularization process.

As for the regularization project, Conceição and Souza (2018) reaffirm that, with the provisions of the new Law, the process must be carried out under a georeferenced survey, a topographic survey, a planialtimetric cadastral survey, and a perimeter plan, and the provision of urban-planning demarcation became a non-mandatory figure. Furthermore, the land regularization project must consider the characteristics of the occupation and of the occupied area in order to define specific urban-planning and environmental parameters, in addition to identifying the lots, the circulation routes, and the areas intended for public use, when applicable.

The law also determines, according to Oliveski *et al.* (2018), the setting of a temporal milestone for purposes of land legitimation—that is, property occupied up to the date of December 22, 2016 may be regularized, without requiring a minimum time of occupation of the area or a linking of its use to housing, it being even permitted for commercial purposes, which may represent a reward for clandestine or illicit occupations.

According to Jesus (2018), Decree No. 9.310 (BRASIL, 2018) established, in its Article 21, that the process will follow these phases: request of the legitimated parties; administrative processing of the request, in which a period will be granted for the manifestation of the holders of real rights over the property and of the abutting owners; preparation of the land regularization project; remediation of the administrative process; decision of the competent authority, by means of a formal act to which publicity will be given; issuance of the Land Regularization Certificate (CRF – *Certidão de Regularização Fundiária*) [[nota: sigla CRF mantida com expansão e tradução, conforme regra 5]] by the Municipality or by the Federal

District; registration of the CRF and of the approved land regularization project at the real-estate registry office in which the real-estate unit with regularized urban purpose is located.

After the submission of the written regularization request, Marrara (2019) states that it will be up to the responsible local body to decide whether or not to receive it. As the restrictive administrative act that it is, the decision to deny receipt of the request must be substantiated with true and correct factual and legal grounds. In addition, it will contain the indication of the measures that must be adopted by the applicant with a view to the reformulation and reassessment of the request, when it has correctable flaws (Art. 32, sole paragraph).

At this stage, Jesus (2018) notes that the regularizing entity or interested party will take to the registry official the registrations of the CRF and of the approved land regularization project; should the official refuse, he must issue a substantiated note of the reasons that led to the refusal, in accordance with Article 40 of Decree No. 9.310 (BRASIL, 2018).

Marrara (2019) states that the approval of the request and the issuance of the CRF do not conclude the urban land regularization. Once the administrative-process phase within the competent municipal body is finished, it will be up to the applicants to collect the certificate and forward it to the local Real-Estate Registry Office for the due measures, beginning the second phase. After the CRF is registered, Jesus (2018) situates that a registration record (*matrícula*) will be opened for each of the regularized real-estate units, thereby initiating the full recognition of ownership for the mere possessor of the property; all these acts referred to in the law aim at the legitimacy and support of the entire procedure, since it allows interested parties, owners, and even abutting owners to manifest themselves regarding their rights, opening room for the remediation of possible irregularities and defining the Municipality as the holder for sending the Land Regularization Certificate to the real-estate registry office.

It is unquestionable, therefore, for Olivieski *et al.* (2018), that the new law is considered yet another important step in the legal framework of urban land regularization, since Reurb is a legal instrument of urban policy, a set of general norms and procedures encompassing legal, environmental, urban-planning, and social measures, with a view to removing certain urban settlements and their occupants from informality.

In view of the above, grounded in legislation, the objective of the work was to structure the process of application of Federal Law No. 13.465 (BRASIL, 2017), known as REURB, which deals with land regularization, obtaining and presenting all the steps necessary for the execution of this process, based on a case study in the city of Mogi Guaçu – SP.

2 MATERIALS AND METHODS

This work presented a study on the application of the Reurb-E Law in a case study, in which the necessary stages were addressed—the administrative process, the request of the legitimated party, and the technical process—for the development of the entire process of regularizing an area that is irregular according to the legislation in force. Such an area is located in the municipality of Mogi Guaçu – SP and is named "Chácaras Santa Rita," with a total of 35 lots implemented irregularly.

For the preparation of the study, satellite images obtained from the Google Earth software (GOOGLE EARTH, 2021) were used, along with documents and technical pieces from the company responsible for the regularization process, documents from different bodies of the municipal government, and inputs and edits in the software Métrica Topo, QGIS 3.18, and the web portal Sigam Datageo and the IGC geoportal.

3 RESULTS AND DISCUSSION

3.1 STUDY AREA

The study area for the application of the Reurb was located in the municipality of Mogi Guaçu, State of São Paulo, Brazil **(Figure 1)**, with coordinates of latitude 22°22'15" South and longitude 46°56'38" West, with an approximate population of 153,033 inhabitants according to the IBGE (2020).

Figure 1

Location map of the municipality of Mogi Guaçu

Source: ROQUE; AYOUB (2020).

The study area was chosen owing to the allotter's interest in regularizing this clandestine urban settlement, since there is already a process under way, which served as the basis for the present study.

This area is a clandestine allotment named "Chácaras Santa Rita," located in the Engenho Velho neighborhood on the SP-342 Highway, with coordinates of latitude 22°18'08.6" South and longitude 46°54'19.5" West, 8.6 km from the center of Mogi Guaçu –

SP, containing 35 lots of at least 1,000.00 m² and implemented clandestinely, given that at the time of its implementation the norms in force for execution and regularization were not followed. The clandestine land subdivision, as Lobo (2019) explains, is one whose existence is not known to the competent Public Authority, or for which approval does not exist—that is, the request is denied or there is no application for approval.

The allotment that is the object of study, as per the images presented in Figure 2, has been in a situation of irregularity since before April 2006, possessing the same constructive and territorial-occupation characteristics for more than 15 years.

Figure 2

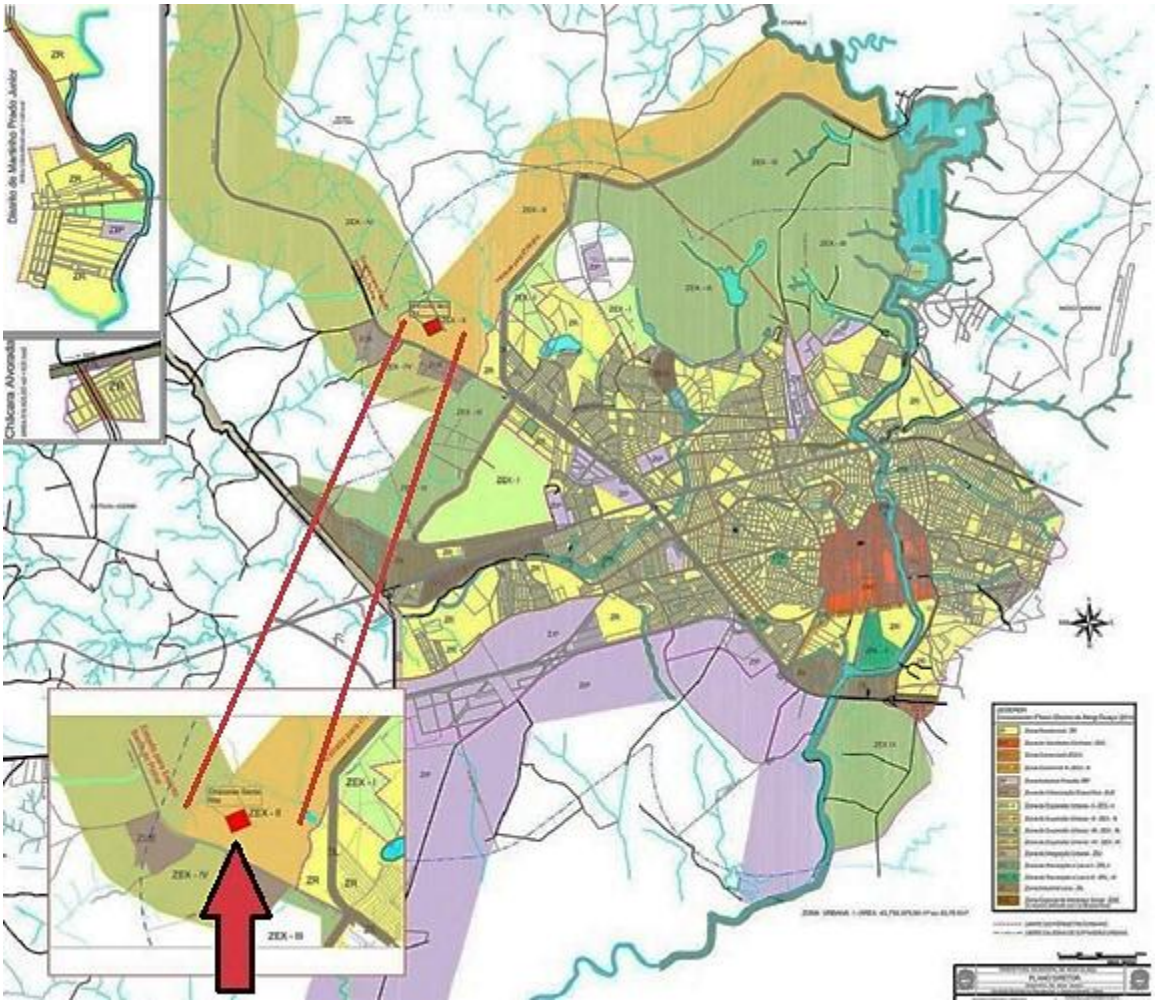
LOCATION OBJECT OF THE STUDY, BEING (A) IMAGE FROM APRIL 2006 AND (B) IMAGE FROM AUGUST 2021

Source: Google Earth (2021).

In accordance with Municipal Complementary Law No. 1.291 (MOGI GUAÇU, 2015a), which deals with the Master Plan (*Plano Diretor*) of the city of Mogi Guaçu, and Complementary Law No. 1.415 (MOGI GUAÇU, 2021b), which provides for the zoning and land-use plan of the municipality of Mogi Guaçu, it can be verified that the area that is the object of this study is located in the Urban Expansion Zone named "ZEX – II" **(Figure 3)**, which are the areas intended for urban expansion beyond the official urban perimeter and which, therefore, possess differentiated urban-planning characteristics, in order to better order the occupation.

Figure 3

ZONING MAP OF THE CITY OF MOGI GUAÇU/SP, HIGHLIGHTING THE LOCATION OF THE OBJECT OF STUDY



Source: Adapted from the zoning and land-use plan of the Municipality of Mogi Guaçu (2021).

3.2 ADMINISTRATIVE PROCESS

The administrative process for carrying out the regularization through the Reurb is regulated in Art. 28 of Federal Law No. 13.465 (BRASIL, 2017), where it will have the following phases: the request of the legitimated parties, classification of the area, preparation of the regularization project, municipal decision, and issuance and registration of the CRF with the real-estate registry office.

3.2.1 Request of the legitimated parties

The first stage of the regularization process is the request of one of the legitimated parties established in Article 14 of Federal Law No. 13.465 (BRASIL, 2017). In this case, the request was prepared by the allotter of the property before the city government, on December

4, 2017, requesting the regularization of the informal urban settlement named "Chácaras Santa Rita."

After the regularization request is submitted, it will be up to the municipality to decide whether or not to accept it. However, as Marrara (2019) cites, in the case of a refusal by the city government, this decision must be substantiated with true and correct factual and legal grounds, in addition to the indication of the measures that must be adopted by the applicant with a view to the reformulation and reassessment of the request, when it has correctable flaws.

As analyzed by Ribeiro (2018), the Reurb, as provided for by Federal Law No. 13.465 (BRASIL, 2017), proposes the regularization of consolidated informal urban settlements, whether large or small, in a unified manner, through a single project for each area. Therefore, regardless of the purpose of the clandestine allotment, the regularization process is applicable, provided that it fits the requirements established in the Law and in the municipal guideline.

To regulate the regularization process and standardize all the procedures, Decree No. 9.310 (BRASIL, 2018) was instituted, establishing the general norms applicable to Urban Land Regularization and setting the procedures for the appraisal and disposal of properties of the Union.

Thus, it was stipulated that the regularization would occur through two types of regularization, which are regulated according to the social characterization that they fit. The typification of the Reurb occurs in two models: Reurb-S and Reurb-E. Reurb-S, known as Land Regularization of Social Interest, is applied when the predominance of the population of the clandestine urban settlement is low-income, being so considered through the Municipal Government. Clandestine urban settlements typified as Reurb-S are exempt from paying the costs of the regularization process, with the entire regularization process—from the preparation of the necessary projects to the existing expenses—falling to the public authority.

Reurb-E, known as Land Regularization of Specific Interest, is applied to persons who do not fit as low-income; therefore, if classified in this modality, those who must bear the costs of the regularization process are the owners.

As for the modality of Reurb to be adopted, as Jesus (2018) cites, the classification of the Reurb modality that will be adopted falls to the municipal executive authority, there being no reason for the official of the real-estate registry office or any other authority to contest the modality used.

According to the return note from the city government on December 6, 2018, the clandestine urban settlement on which this study is based was classified as Reurb-E, since,

after analysis of documents by the city government, divergences of the clandestine allotment from the legislation that approves allotments were verified.

It is important to highlight that the land regularization process often occurs owing to a pressure external to the owners, as occurred with the object of study in question, in which there is a Conduct Adjustment Agreement (TAC – *Termo de Ajustamento de Conduta*) [[nota: sigla TAC mantida com expansão e tradução, conforme regra 5]], in a public civil action, placing on the owner the accountability for the regularization.

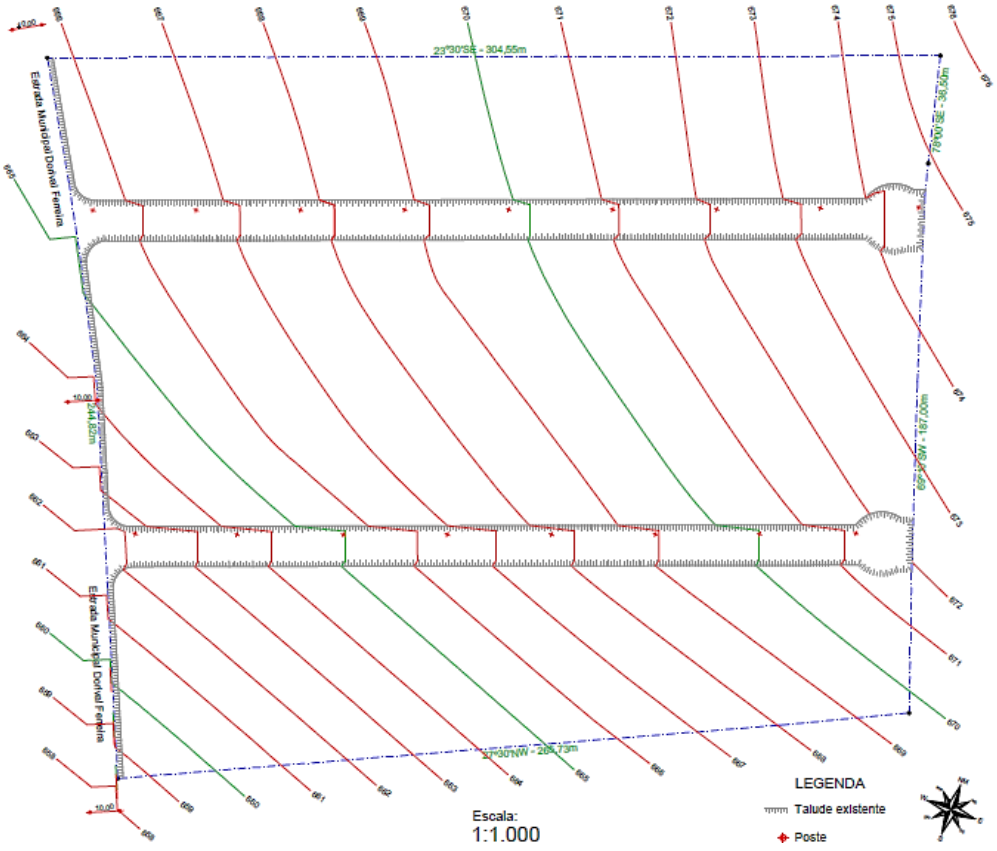
3.3 TECHNICAL PROCESS

The land regularization process continues with an administrative process containing the technical pieces that support the analysis by the public authority as to compliance with the laws and norms of the minimum structures required.

The first of these is the planialtimetric survey to support the initial analyses of the location of the lots and the runoff of rainwater, as well as of structures for managing precipitation, as presented in Figure 4, accompanied also by a location plan of the enterprise over an image, and the project for paving and gravel of the carriageways.

Figure 4

PLANIALTIMETRIC SURVEY

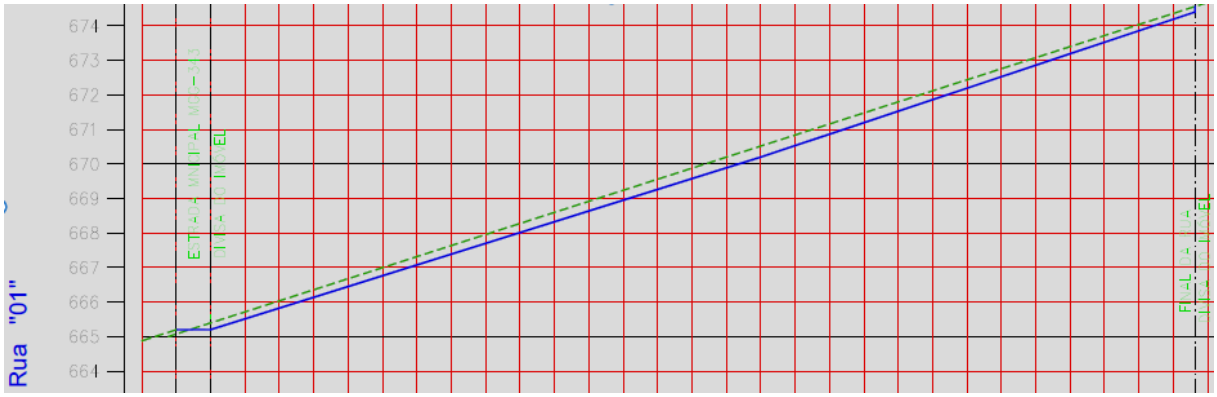


Source: technical pieces of the administrative process, 2020.

It is important to emphasize that each existing street within the allotment must be presented with its respective profile project, as presented in Figure 5 for one of the internal axes of the property.

Figure 5

LONGITUDINAL PROFILE OF "STREET 01," IN THE NORTHERN PART OF THE PROPERTY, WITH ITS RESPECTIVE ELEVATIONS ON THE X-AXIS AND HORIZONTAL DISTANCE ON THE Y-AXIS



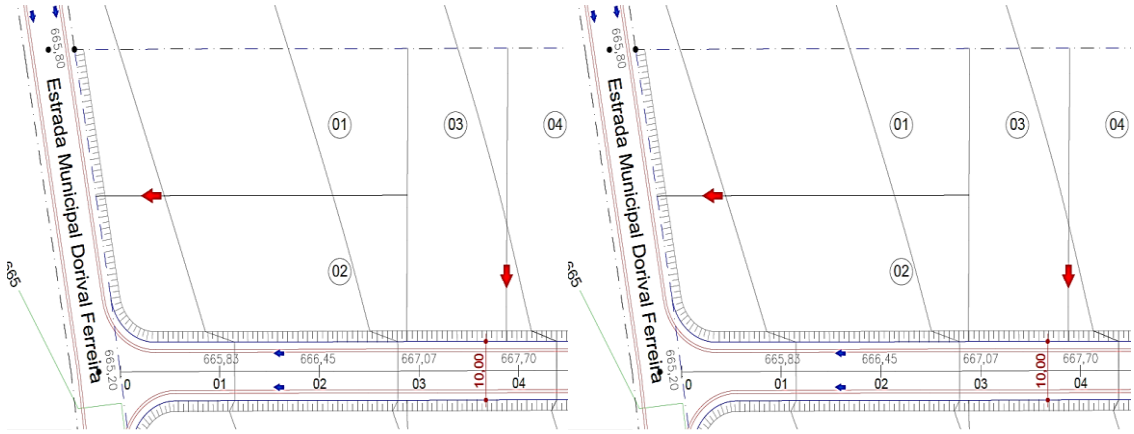
Source: technical pieces of the administrative process, 2020.

With staking every 10 meters, the first 160 meters have a slope of 3.13% and the final 126.28 meters a slight increase in slope, to 3.33%, a fact that is repeated for the other existing internal axis. The presentation of maps that allow the correct analysis by the technical team of the municipal government is important to highlight.

The Earthwork and Urban-Planning projects are fundamental for the analysis of the distribution of the existing lots in relation to the direction of drainage of the blocks and streets, the channels existing on the streets, green areas, areas for urban and community facilities, the dimensions involved, and the abutting properties **(Figure 6)**.

Figure 6

INITIAL PROJECTS PRESENTED FOR REGULARIZATION, BEING (A) DETAIL OF THE EARTHWORK AND DRAINAGE PROJECT, WITH THE DIRECTION OF DRAINAGE AND SLOPES, AND (B) DETAIL OF THE URBAN-PLANNING PROJECT CONTAINING AN AREA FOR COMMUNITY FACILITIES



(a) (b)

Source: technical pieces of the administrative process, 2020.

The base project and calculation memorandum for defining the destination of the liquid effluents of the allotment lie in the sanitation and sewage project. As the irregular allotment that is the target of the present research is far from the public sewage collection network, it was opted to design cylindrical septic tanks, anaerobic filters, and cylindrical soak pits (*sumidouros*) for the treatment of domestic effluents, individually, in accordance with NBR 13.969 (ABNT, 1997).

The useful volume of each septic tank is given by **Equation 1**.

$$V = N \times [C \times T + (K \times Lf)] \quad \textbf{(Equation 1)}$$

Where: V = useful volume (in liters); N = number of contributors (5 inhabitants adopted); C = daily contribution of waste (150 liters/person/day); T = hydraulic detention time of sewage in the tank (1 day); K = accumulation rate (57); Lf = per capita contribution of fresh sludge (1 liter/person/day). With a result of 1,035 liters or 1.035 m³, a volume of 1.19 m³ was therefore adopted for the septic tank, which will be designed with a depth of 1.25 meters and a diameter of 1.10 meters.

The anaerobic filter, which consists of a biological reactor where the sewage is purified by means of facultative and anaerobic microorganisms responsible for the stabilization of the organic matter, is given by **Equation 2**.

$Vu = 1.6 \times N \times C \times T$ **(Equation 2)**

Where: Vu = useful volume of the filter (in liters); N = number of contributors (5 people); C = contribution of waste (150 liters/person/day); T = detention period (1 day). With a result of a useful volume of 1,200 liters or 1.200 m^3; and, for the biological filter, the limit height of the filter bed is 1.20 meters, already including the height of the false bottom, which must be limited to 0.60 meters, already including the thickness of the slab; therefore, a volume of 1.71 m^3 was adopted for the anaerobic filter, which will be designed with a useful height of 1.80 meters and a diameter of 1.10 meters.

For the sizing of the soak pits, the final stage of effluent treatment, infiltration tests were carried out through cylindrical pits, with the aid of an auger. After the tests, a soil infiltration coefficient on the order of 52 L/m^2 was determined. Adopting a maximum daily flow on the order of 1.00 m^3/day for each residence, **Equation 3** was used.

$Ai\_soak\ pit = (Vc / Ci)$ **(Equation 3)**

Where: Ai_soak pit = internal area of the soak pit (m^2); Vc = contribution volume ($m^3 \times$ day); Ci = soil infiltration coefficient (liters/m^2). With a result of an infiltration area of 19.23 m^2, and adopting a cylindrical soak pit with a diameter of 2.00 m and a useful height of 2.60 m, an infiltration area of 19.48 m^2 is obtained, meeting the calculated value.

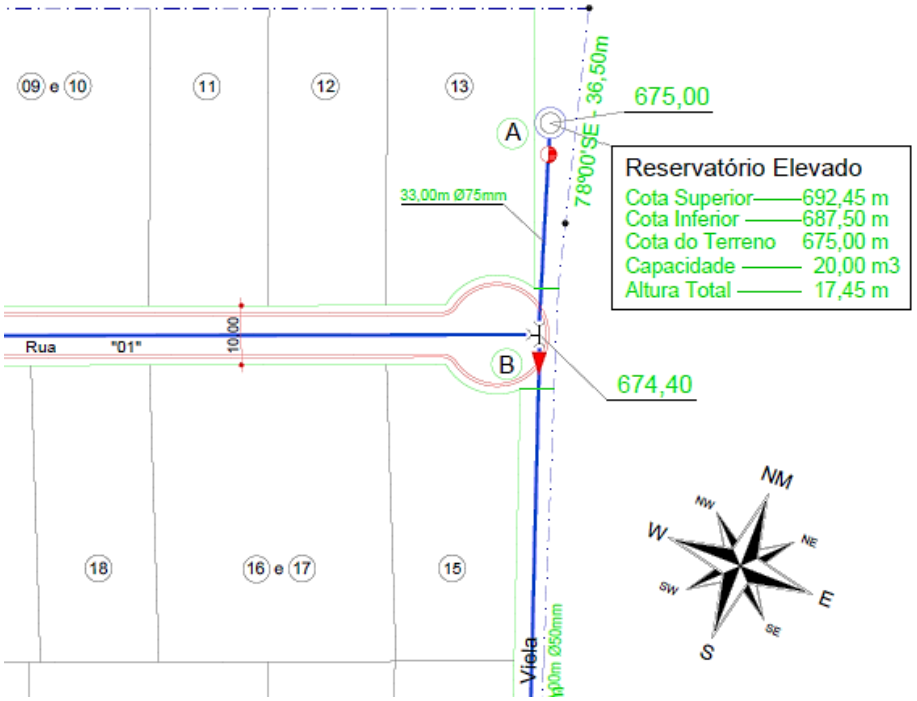
It is important to highlight the study by Santos and Roque (2017), in which they verified the nonexistence of these structures for the final destination of effluents in residential developments; even though there was a detailed scheme for the correct execution of the Septic Tank, filter, and soak pit, they concluded that basic sanitation is not a priority for professionals in the execution of works for which they are responsible. Thus reaffirming that, even if there are existing projects, as concluded by Reis *et al.* (2016), it is fundamental that the oversight bodies and the population in general pay attention to the correct destination of sanitary sewage, as well as ponder the importance of following the engineering projects approved by official bodies.

The last item to be part of the technical pieces in the regularization process is the potable water supply project. The calculation memorandum must present the sizing of the quantification of the set of pipes and accessories intended for the distribution of the potable water supply network to the entire allotment in a continuous and uninterrupted manner.

The potable water project must contain, in addition to the distribution of the necessary equipment, the total length of the distribution network, as shown in detail in Figure 7.

Figure 7

DETAIL OF THE POTABLE WATER PROJECT, SHOWING THE ACCUMULATION AND DISTRIBUTION POINT



Source: technical pieces of the administrative process, 2020.

It begins with the forecast of the resident population, as a function of the occupation area, in a total of 35 lots, and an average number of inhabitants per lot of 5 people, reaching 175 inhabitants, with a saturation population of the area (end of plan) equal to 200 inhabitants, using a project horizon with a forecast of saturation of the allotment of 20 (twenty) years. The water is intended exclusively for domestic use, comprising the following purposes: hygienic, alimentary, floor and clothes washing, garden watering, among others. The per capita water consumption (q) adopted was 250 liters/inhabitant/day, and the minimum dynamic pressure at the most unfavorable point will be 12 meters of water column (mwc).

For the calculation of the average project flow, **Equation 4** is used.

$$Qm = q \times P / 86,400 \quad \textbf{(Equation 4)}$$

Where: Qm = average flow (in liters); q = per capita consumption; P = saturation population. Reaching a value of 0.58 liters per second of necessary average flow. It then proceeded to the design flow (Q) using **Equation 5**.

$$Q = Qm \times K1 \times K2 \quad \textbf{(Equation 5)}$$

Where: K1 = daily variation adopted as the coefficient of the day of greatest consumption (1.20); K2 = hourly variation adopted as the coefficient of the hour of greatest consumption (1.50). Reaching 1.04 liters per second, which will be the basis for the calculation of the distribution flow according to **Equation 6**.

Qd = Q / lt **(Equation 6)**

Where: lt = total length of the network (714.00 meters, obtained from the map in **Figure 7**). Reaching a distribution flow of 0.00146 liters per second for each meter of network. The capacity of the reservoir (C) was calculated by the method based on a consumption curve assimilated to a sine wave.

Where V is the volume of water consumed in 24 hours on the day of greatest consumption:

$Q = 1.04\ L \cdot s^{-1} = 3.74\ m^3/h$; $K1 = 1.20\ V = 3.74 \times 24 \times 1.20 = 107.71\ m^3$

The minimum capacity of distribution reservoirs for normal consumption, as a function of K2, is given by **Equation 7**.

C = 0.16 × V **(Equation 7)**

Reaching a reservoir volume of 17.24 m^3, an elevated goblet-type (*taça*) reservoir was then adopted, with water in the column, of a capacity of 20 m^3.

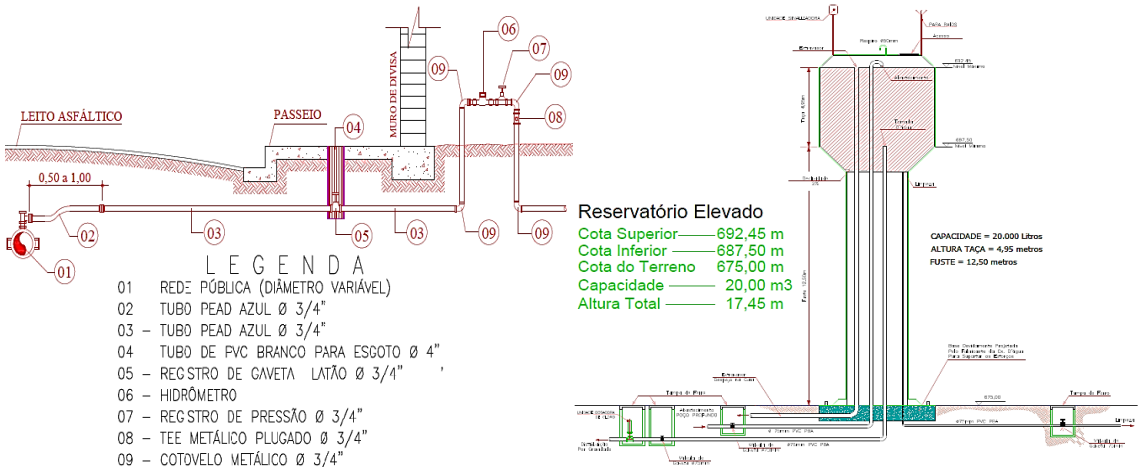
The basis for the correct distribution of water throughout the allotment is the calculation of the most unfavorable piezometric elevation, with the upstream end of section 4 being defined as the most unfavorable; its upstream piezometric elevation (Cpj) is calculated according to **Equation 8**.

Cpj = Ct + H + 12 **(Equation 8)**

Where: Ct = terrain elevation (674.40 m); H = 0.108 (head loss); 12 mwc = (minimum dynamic pressure permitted in the network). Reaching a value of 686.51 meters, which is the basis for the calculation of the reservoir height; subtracting from the Cpj the terrain elevation of the reservoir (675.00 m), therefore, 11.51 m of height, the height of 12.50 m was then adopted, following the detailing of the reservoir presented in Figure 7, and the household connections presented, with piping in the water distribution network in rigid PVC PBA class 20 pipes.

Figure 8

Details of the household water supply connections (a), and the reservoir for the accumulation of water from a deep well, with respective connections and base (b).



(a) (b)

Source: technical pieces of the administrative process, 2020.

With this set of technical pieces and the duly registered request, the irregular allotment is equipped with technical material to comply with the Reurb and is ready for the analysis by the public authority as to the technical procedure in the regularization process, with the issuance of the Land Regularity Certificate to the occupants qualified individually, according to the lots, for purposes of subsequent registration, with the official of the Real-Estate Registry Office responsible for the locality.

4 CONCLUSION

Federal Law No. 13.465 (BRASIL, 2017) brings a set of instruments that facilitate and allow the land titling of irregular allotments; however, because it is relatively recent legislation, many professionals still have problems in its conduct and execution, there being a deficiency in its technical application and in the legal conduct of the process. Nonetheless, as demonstrated in the present work, the process occurs within the municipal sphere and with technical pieces well known to the technical staff involved with land management.

The allotment that is the object of study, with a total tract area of 65,299.36 m², has been in a condition of irregularity for more than 15 years and finds in the current legislation the possibility of regularization and titling for the owners of the lots. The process must pay attention to the allocation of green areas, urban facilities, and community facilities as recommended in the legislation and in the municipal definitions, in accordance with the zones contained in the municipal master plan.

The classification as Reurb-E requires that the owner hire a professional accredited with the Regional Council of Engineering and Agronomy (CREA – *Conselho Regional de Engenharia e Agronomia*) [[nota: sigla CREA mantida com expansão e tradução, conforme regra 5]] to conduct the technical pieces and a lawyer to conduct the legal process.

It must be emphasized that the process does not end with the issuance of the CRF, there being a need for the owners of the lots to carry out registration with the Real-Estate Registry Office.

Irregular allotments are an old problem of the municipalities, and with the increase in real-estate speculation in peri-urban areas, they tend to increase, there being a constant need for public managers to monitor these processes of occupation of the territory and to make effective use of Federal Law No. 13.465 (BRASIL, 2017), ensuring the possibility of titling the property for its occupants and also the integration of the informal urban settlement into the urban territorial ordering, thus ensuring access to public services that were previously nonexistent.

It is hoped that the present work will shed light on the description of the process of regularizing a typically irregular allotment, these procedures being valid throughout the national territory, thus contributing to a greater popularization regarding the application of the legislation involved in the management of the territory.

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