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Main or Supporting Actor?

The Role of Official Urban Planning in Brasília, Brazil

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ABSTRACT

This paper evaluates the official urban planning in Brasília (Brazil) through a diachronic discussion regarding land occupation and the role of the local government as a dubious agent which plans and regularizes settlements. The investigation is supported by a configurational approach, according to the procedures and techniques related to the Theory of the Social Logic of Space. The analysis is structured in four stages (from the foundation of Brasília in 1960 to nowadays) and is based on an official land occupation database in Brasília (SISDUC and Geoportal). The findings point to an evident gap between official planning and urban occupation, since the early beginning of the new Brazilian capital, which always comes one step ahead of planning. Despite the local history as a planned city, what has been seen, especially in the last decade, is urban planning giving way to informal initiatives. Official planning is failing to anticipate demand for social housing and promote territorial integration among different income groups. It is also observed there are two "cities" that coexist in Brasilia but are not effectively connected: the Pilot Plan and the peripheries. The resulting system seems lead to an urban dynamic similar to any Brazilian metropolis, whose original or historical site tends to a certain degree of isolation while the peripheries develop their centralities. On the eve of the local master plan review (PDOT), it seems essential to raise these issues, seeking to reclaim the role of local government as manager of the territory.

KEYWORDS

Urban Planning, Brasília/Brazil, Land Occupation, Space Syntax

1 INTRODUCTION

The text addresses the topic of official urban planning, that is, the one that comes from actors who hold the legal attributions to think the city. They are professionals and politicians with the right/duty to guide urban growth through plans, policies, projects, and actions, as well as to implement them, aiming to give the urban environment healthy characteristics for life in society.

The focus of the research is on the diachronic investigation of the relationship between official urban planning and formal and informal occupation in the Federal District (Brasilia, Brazil) - from its implementation to the present day - discussing the role of official planning in the construction of the settlement.

As a planned city from its inception, Brasília was chosen as a case study because it enables the analysis of urban planning since its origin. We assume as "first planning" the project by Lucio Costa, winner of the contest for the Pilot Plan of Brasília, published in the Official Gazette of the Federal Government [*Diário Oficial da União – DOU*], on September 30, 1956. Planning actions can be understood as determining agents for the dynamics of the construction of the urban fabric in the capital city, with consequences on expansion over the decades that followed its inauguration on April 21, 1960.

The diachronic study of the dynamics of official planning - whose marks on the urban fabric are related to the constant presence of irregular settlements - can elucidate to what extent and circumstances these elements (official planning and irregular settlements) exert mutual influence, since these irregular occupations, once constituted and consolidated, start to claim from the State the right to enter the regularization process. Tacit authorization is alleged on account of the State's inaction and, more than that, they are absorbed by the urban fabric and considered in the elaboration of the next official urban planning, since they are present in the city, creating a feedback loop. This analysis is aimed at understanding how the city has been built, and how much of this city is the product of official planning and informal occupation.

In relation to the types of occupation of the Federal District territory, and from a legal perspective, it is relevant to define what are formal and informal occupations for the present paper. Occupations are considered formal when their origin comes from a government source in their elaboration, implementation, or the hiring process for implanting the project, which most times is a public tender. In addition, there are regular occupations of a private nature, which have been approved by the responsible government bodies, from which it can be inferred that there has been an adequate urban feasibility study by the approving body, presuming some sort of planning. On the other hand, informal occupations will be those lots or developments implemented without governmental input in its origin or without any approval from the public authorities.

Based on the previous information, the general objective of the study is to evaluate the role of urban planning in the construction of the territory of the Federal District, through a diachronic configurational reading of the established settlements, as an agent that at times previously conditions the occupation of the territory, and at other implements unforeseen occupations. Furthermore, it is intended: a) to identify the diachronic priorities of land occupation in the Federal District [DF]; b) to evaluate the dialogue between dispersion and occupation in its

urbanization process; c) to analyze the relationship between the history of public policies for the area under study and the result of the territory occupation model; and d) to verify the effectiveness in the "sewing" of fragmented fabrics by the incorporation of planned settlements and its reflections locally and globally.

2 METHODOLOGY

The first stage of the research encompasses the survey of current and historical data on the urban expansion of the Federal District. The interpretation was divided into four stages, based on the temporal division proposed by Paviani (2007), with adaptations to suit the urban planning documents prepared by the Federal District Government - GDF. Each of them corresponded to a set of periods for information aggregation, structured as follows:

Stage 1 - corresponds to the interval between 1958 and 1975, considered by Paviani (2007) the "pioneer period", with the effective transfer of the federal capital to Brasília and subsequent consolidation. Parallel to the construction of the Pilot Plan, the first "satellite cities" were established and the segregationist process of the polynucleated urbanization model took place. The foundation of Taguatinga, in 1958, is considered the inaugural mark of this new urban system. It is a period with several actions of urban planning and movements of territorial occupation.

Stage 2 - from 1976 to 1997, despite a smaller growth compared to the previous stage, it is still a period "rich in actions for the consolidation of Brasília" (PAVIANI, 2007, p. 10). It expresses the beginning of the official global planning with the edition of the PEOT (*Plano Estrutural de Organização Territorial* – Structural Plan for Territorial Organization) in 1977, anticipating the elaboration of the document *Brasília Revisitada* (Brasília Revisited), in 1986, and the PDOT (*Plano Diretor de Ordenamento Territorial* – Master Plan for Territorial Organization), in 1992. During this phase, Brasília was declared a World Cultural Heritage Site by UNESCO (in 1987), embassies were transferred, and mansions were built in *Lago Sul* and *Lago Norte*. With the Federal Constitution of 1988, the Metropolitan Area of Brasília (AMB) became effective, and the territory gained administrative autonomy. An intense irregular appropriation of public or private lands, by the middle class or the disadvantaged, also began, leading to a true "disorganization in the occupation of the territory" (PAVIANI, 2007, p. 12). In view of this, new settlements began to be implemented by the public authorities, such as Samambaia, in 1989, and Águas Claras in 1992, originally designed for a population of 163,000 inhabitants.

Stage 3 - from 1998 to 2009, comprises the period marked by the "metropolization that reaches the years after 1990 and is characterized by the search for political and administrative autonomy of the territory. It is a 'crucial movement for the emergence of a true tertiary and quaternary metropolis: cleaning up slum areas in the Pilot Plano, transferring residents of the so-called 'backyards' of the satellite towns, revealing segregation with socio-spatial peripheralization"

(PAVIANI, 2007, p. 11). In 1997 the PDOT was issued, through Complementary Law No. 17 of January 28. Population growth was more restrained in relation to the previous stages and informal settlements proliferated in areas farther from the Pilot Plan, reflecting the limited availability of real estate and its high costs.

Stage 4 - from 2010 to 2019, is the current period, in which the Integrated Development Region of the Federal District and Surroundings - RIDE is strengthened. Although created under Complementary Law No. 94, enacted in 1998, it has had its importance and consolidation accentuated in recent years. This stage is under the validity of the current PDOT, initially released in 2009, revised in 2012, and which should have been revised in 2019, but due to the political scenario and the current pandemic as of 2020, is still awaiting revision. This stage is marked by urban regularization and by large settlements for lower income families, through the district's *Morar Bem* Program, in partnership with the federal government's *Minha Casa Minha Vida* Program (PMCMV). One of the products is the emergence of condominiums aimed at lower income families, such as Jardins Mangueiral, Paranoá Parque and Itapoã Parque. Paviani (2007) also highlights as a characteristic of this stage the establishment of slums, as it occurred in Estrutural and Itapoã. Here a strong public policy of land regularization takes place, seeking to absorb the consolidated informal occupations.

After the demarcation of the periods to be analyzed, for the entire time interval, blueprints, aerial images, standards and legislation that guided the occupation of the territory were consulted. The public policies for the Federal District were also verified, or the lack thereof, understood as defining the diachronic transformation of the federal capital since the Report on the Pilot Plan of Brasília until the most recent urbanistic plans that sought to discipline and direct the city's growth.

For this purpose, the SISDUC (System of Urbanistic and Cartographic Documentation - *Sistema de Documentação Urbanística e Cartográfica*, SEDUH/GDF) was first searched for all the documents available in the system referring to projects and legislation by 31 Administrative Regions. Although there are urbanistic projects beyond the database offered in the SISDUC portal, such as cancelled or replaced projects, or even those which for various reasons were not registered, a decision was made to analyze only the online system records, as they allow access to the public, both via SISDUC and Geoportal (Territorial and Urban Information System of the Federal District - *Sistema de Informações Territoriais e Urbanas do Distrito Federal*, SEDUH/GDF). This research decision was made due to the fact that there was already a robust database to be analyzed only with these available files. Besides, there would not be enough time to investigate projects whose memory could have already been lost due to the lapse of time and possible loss of documents in the meantime.

In total, 4,537 documents in several categories were obtained from SISDUC: Location plans referring to the Building Code - CE; Detailing Plans - DET; Urbanistic Guidelines - DIUR; Location and Building Standards - GB; Project Description - MD and MDE; Building, Use and Location Standards - NGB; Registered Plans - PR; No Registered Plan - SemPR; Landscaping Project - PSG; Occupancy Plan - PUOC; Road System Project - SIV; Topographic Survey Project - TOP; Urban Planning Project - URB; Urban Planning Project for Housing Program - URB - PH; Project Description for Housing Program - MDE-PH; Project Description for Land Division Regularization - MDE-RP and Project for Land Division Regularization - URB-RP.

From these, PR, SemPR, URBs and URBs-RP were selected, totaling 2,466 projects (Table 1). These categories were chosen because they were the most appropriate for the intended approach, since they represent the projects prepared by the official urban planning bodies for the occupation of the territory. Despite the methodological decision, it is acknowledged that the other topography, landscaping, road system, detailing, and occupation plan projects are part of the city's official urban planning. However, the volume of items in view of the impact on territorial occupation would not justify the choice due time constraints. A similar situation occurred with the documents linked to legislation, such as norms on location, use and occupation (GBs, NGBs and MDEs), which were used only for consultation.

With this survey in hand, the data were systematized in an electronic spreadsheet, separated by Administrative Region (AR), classified in ascending order considering the year in the SISDUC as the date the documents were drafted. From the spreadsheets we proceeded to open the files, one by one, to fill out the tables with the complete date in the day/month/year format and the description about the content of the projects.

The goal of this procedure was twofold: 1) verify the area on which each project focused for subsequent drawing of their respective *shapesfiles* on the maps, with the aid of the QGIS software drawing tool; and 2) check the date that appeared on the stamp of the plans. It was verified, in a few cases, that some registered projects not available in SISDUC were in Geoportal, therefore, they were incorporated to the study. When it was impossible to verify the date of these projects on the plan itself, the date of registration available on Geoportal was considered.

The data were then grouped by periods in accordance with the dates of the urban areas made available on Geoportal, with some adjustments: (i) from 1958 to 1960, (ii) from 1961 to 1964, (iii) from 1965 to 1975, (iv) from 1976 to 1982, (v) from 1983 to 1986, (vi) from 1987 to 1991, (vii) 1992 to 1997, (viii) from 1998 to 2004, (ix) from 2005 to 2009, (x) from 2010 to 2013, (xi) from 2014 to 2015, (xii) 2016, (xiii) 2017/2018 and (xiv) 2019.

Table 1: Table of the number projects observed per period, for each AR.

RA	NAME/ID	1958 to 1960	1961 to 1964	1965 to 1975	1976 to 1982	1983 to 1986	1987 to 1991	1992 to 1997	1998 to 2004	2005 to 2009	2010 to 2013	2014 to 2015	2016	2017 to 2018	2019	SUBTOTAL NUMBER OF PROJECTS
RA I	PLANO PILOTO	50	60	386	176	58	40	13	19	6	9	7	7		3	834
RA XVIII	LAGO NORTE	5	5	8	28	14	7	8	3	2	1	1	1		1	84
RA XVI	LAGO SUL	5	3	67	45	9	4	8	5	1	3	2			3	155
RA XXIV	PARK WAY	3	1	6	6	4	5	1	3							29
RA XXIX	SIA	1	3	12	19	5	3	3	2	1						49
RA XI	CRUZEIRO	1	1	46	35	1	5	1								90
RA XXII	SUDOESTE/OCTOGONAL		1	17	6		10	4	5	1					1	45
RA III	TAGUATINGA		20	85	47	24	20	8	2	1					1	208
RA V	SOBRADINHO		12	25	19	7	1	2	1	4	3		5	1	5	85
RA II	GAMA		6	63	19	24	10	10	1	1		1				135
RA VIII	NUCLEO BANDEIRANTE		2	28	6	12	5	3	6							62
RA XIX	CANDANGOLÂNDIA			1	1	8	2	1	3					1		17
RA X	GUARÁ			34	28	15	9	6	7	3					1	103
RA VI	PLANALTINA			13	17	10	8	4	5	4			1	1	3	66
RA IV	BRAZLÂNDIA			12	12	13	8	3	1			1		1		51
RA IX	CEILÂNDIA			56	85	38	11	7	16	2	1		1		3	220
RA XII	SAMAMBAIA			1		94	5	3	4	1			2		2	112
RA XXV	ESTRUTURAL/SCIA			2				1	3		1					7
RA XXVII	JARDIM BOTÂNICO				1	1			4	4					3	13
RA VII	PARANOÁ				1			1		2	1		1			6
RA V	SOBRADINHO II						1	2	1	1			1	2		8
RA XVII	RIACHO FUNDO						3	3								6
RA XXI	RIACHO FUNDO II							1	2	1	3	1	1			9
RA XX	ÁGUAS CLARAS							12		4	2					18
RA XV	RECANTO DAS EMAS							3	8	1	2		1	1	3	19
RA XIII	SANTA MARIA							7	4	2		3		3	2	21
RA XIV	SÃO SEBASTIÃO							1	2	1	2	2			1	9
RAXXIII	VARJÃO								1							1
RA XXVIII	ITAPOÃ													2		2
RA XXX	VICENTE PIRES											1		1		2
RA XXXI	FERCAL															0
TOTAL NUMBER OF ANALYSED PROJECTS PER PERIOD		65	114	862	551	337	157	116	108	43	28	19	21	13	32	**2.466**
		2,6%	4,6%	35,0%	22,3%	13,7%	6,4%	4,7%	4,4%	1,7%	1,1%	0,8%	0,9%	0,5%	1,3%	100,00%
		42,21%			47,08%				6,12%		4,58%					100,00%

Source: Based on data provided by SISDUC (SEDUH) and Geoportal (SEDUH).

Subsequently, the existing Geoportal database was searched by downloading the shapefiles referring to "registered lots" and "urban expansion". The urban area available on the previously mentioned portal proved to be fundamental in the investigation, since it allowed obtaining the real diachronic occupation of the territory as compared to what had been designed by the public power.

Next, we moved on to the mapping phase in QGIS, with the design of *shapesfiles* for each project. For each period, a synthesis map was drafted, using the georeferencing of the project plans. The maps thus obtained had the shapes from the modeling of the projects merged into a single layer and colored in gray. The result of the procedure for the first period of analysis (1958 to 1960) was repeated for the other subsequent periods, with subsequent overlaying of the shapes merged.

For the modeling of the polygons referring to each project, different situations were identified: a) some projects were precisely delimited, b) in other cases, however, they presented large areas without a precise delimitation of the project composed of lots with large interstitial green areas. In addition, not all of the 2,466 projects initially selected were used in the modeling of the shapes, since several plans, when checked, consisted of: schematic sections of location plans, underground floor plans, installation plans, location of blocks, location of magazine stands, details of access to blocks and parking lots, small insertions of plots or conjuntos (which for the purpose of the study would not have a major impact), or even sections contemplated in previous projects, which were reconfigured with few changes, among others. Also, a few projects could not be accessed by SISDUC and others were not territorially located, as they did not have immediate surroundings or situation plan. Possibly they comprise unimplemented or deconstructed plots: thus, out of the total of 2,466 projects, 667 (27.05%) were used for modeling in QGIS.

Finally, the shape provided by Geoportal was added to each map referring to the urban area of the corresponding period. This was highlighted with red outline and hatching, to visually differentiate it from the other project areas.

Regarding the variables, three measures were examined for the investigation of the four selected stages, each of them further separated into periods:

Planned Area (in km^2), extracted from the System of Urbanistic and Cartographic Documentation - SISDUC (SEDUH/GDF), based on the verification of all projects added to the system that met the criteria established for the selection of the sample.

Occupied Area (in km^2), obtained from the Territorial and Urban Information System of the Federal District - Geoportal (SEDUH/GDF), based on the available shapes for each of the periods available on the platform. Occupations are either formal (when they originate from a government or private source and are approved by the responsible public bodies) or informal (when they do not originate from a government or have no prior approval by the public authorities). Informal occupations, when regularized, are included in the calculation of planned areas, according to the methodology defined for this research.

Population (in number of inhabitants), according to data produced by the IBGE for the national censuses, or according to the Population Estimate, also from the IBGE, referring to July 1st of each year.

Once the elaboration of the maps and extraction of variables were concluded, the next phase comprised the comparison of the results with the syntactic configurational modeling elaborated

by Coelho and Medeiros (2019), according to the time intervals proposed by the authors - (i) 1964/1965, (ii) 1977/1978, (iii) 1986, (iv) 2009 and (v) 2015. The action allowed us to verify the degree of correspondence between the two levels of analysis (projects and configuration), since Space Syntax could point out patterns of land use and social behavior not explored by other scientific methods, but which are underlying.

3 RESULTS AND DISCUSSION

3.1 Projects and Occupation

The results obtained from the analysis of the projects effectively represented in the research (spatialized in the georeferenced mapping, as expressed in the previous item) allowed us to derive the area covered by the official planning through the elaborated projects. These areas were confronted with the urban areas corresponding to the effective territorial occupation, for each of the stages and periods, according to the variables being analyzed.

The consolidation of the results from an overall perspective is represented in Figure 1, where one can see the compared performance, throughout to the long period of investigation. By analyzing the lines, it can be seen that the territory covered by the official projects is, from the beginning, much greater than the urban occupation, which is plausible considering the creation of Brasília as a new city and the large area that the actions encompassed. From 1964 onwards, with the Pilot Plan already configured, there was a marked reduction in the development of urbanistic projects. This was due to the military coup of 1964 and the political uncertainties as to the settlement of the new capital on the Central Plateau in face of this new scenario. On the other hand, occupation grew from 1964 to 1975, which is associated with the progressive arrival of civil servants to occupy the already planned areas, as well as workers from diverse backgrounds in search of opportunities.

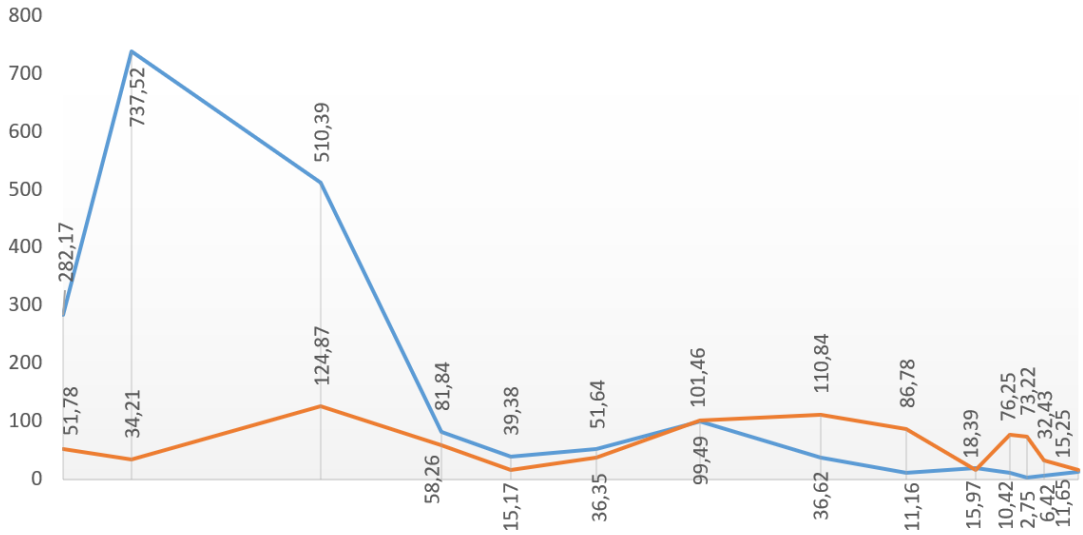


Figure 1: Planned area (blue) vs. occupied area (orange) for the entire analysis interval (1958-2019) (absolute data, non-cumulative, in km2).

From 1975 onwards, the areas referring to occupation and urbanistic projects decline even more, coming closer together as of 1982 and advancing in parallel, although in decline until 1986, possibly due to the recessive scenario in the Brazilian economy. From that date on, occupation and planning gradually begin to pick up again and surpass the 1982 mark in 1997.

In the following 15 years, occupation and planning distance themselves from one another, with occupation surpassing planning, which points to the difficulty of the public authorities in facing the advance of urbanization. This is the moment when informal gated communities emerge and there is little offer of real estate made legally available by the public authorities: the lines come closer together again, at a low level in 2013, reflecting what seems to be a stagnation. After this moment, occupation regains strength in 2015 and 2016, always greater in terms of area than the planned one, until 2019, when the two lines come closer together again after a new decline in occupation.

When the added data were analyzed for the purpose of creating benchmarks only of the four stages, as shown in Figure 2, we notice a decline in official urban planning, while urban occupation remains practically constant, which denotes the gradual exit of the public power as promoter of the urban fabric. Urban occupation, in turn, surpasses urban planning from the 2000s onwards, which suggests that this is the time when informal processes effectively take the lead in the Federal District, considering possible methodological caveats.

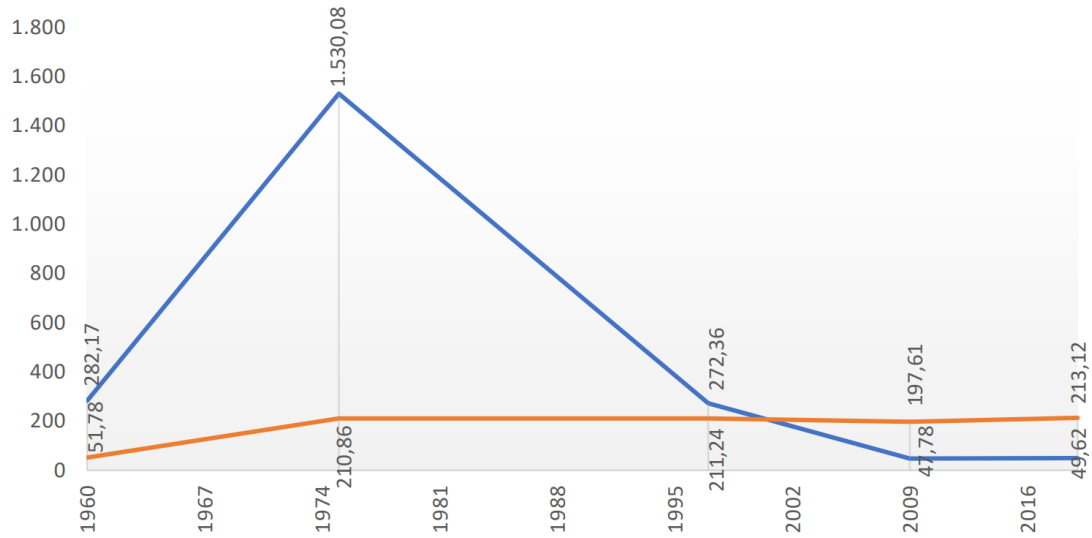


Figure 2: Planned area (blue) vs. occupied area (orange), pursuant to the four stages selected for the study (absolute data, non-cumulative, in km2).

Figure 3 contains the cumulative number of occupations and officially prepared/approved projects. The results show an almost constant and ascending line for occupation. For planning, on the other hand, after a significant initial impulse until 1975, the straight line changes inclination, slowing down progressively. In recent years, based on the land regularization policy, many of the projects have been generated based on informal occupation, either by government or private initiative.

For the debate regarding urban expansion, it is relevant to observe the population growth to verify the compatibility between these two aspects and the existence of a possible causal link. Table 2 represents the index of how many times the population of the DF grew in relation to the previous decade, according to data from the IBGE censuses. It is noteworthy that when the graphic of urban planning by stages - Figure 3 - is compared with the DF population growth - Table 2, there is a clear synchrony.

The relevant population growth until 1970 (3.85 in relation to 1960) corresponds to the period of the largest planned area in the DF (peaking at 1,530.08 m^2 at the end of Stage one, in 1975). This is the time of construction and expansion of the Pilot Plan, which attracted a significant contingent of workers in search of new opportunities, and of civil servants transferred from Rio de Janeiro, among others interested in finding opportunities in the new city. After this point in time, the index begins to decline in parallel with urban planning, as the city also stabilizes and presents growth compatible with other Brazilian cities.

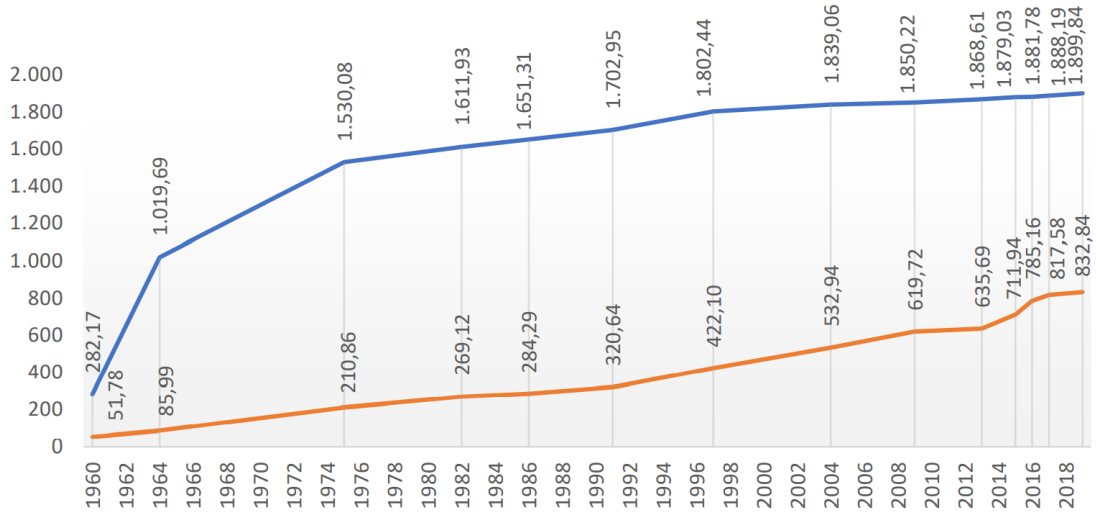


Figure 3: Planned area vs. occupied area in km² for the analysis interval (absolute data, cumulative, in km2).

Table 2: DF's population growth index, by decade.

Decade/Reference	Population	Population Growth Index
1950	-	
1960	141.742,00	*1,00*
1970	546.015,00	*3,85*
1980	1.203.333,00	*2,20*
1991	1.598.415,00	*1,33*
2000	2.043.169,00	*1,28*
2010	2.570.160,00	*1,26*
2019	3.015.268,00	*1,17*

Source: Based on IBGE data (SIDRA), with adaptations.

With the analysis of the urban area in these periods (Figure 4), confronted with the urban planning of the Federal District, a more robust discussion about the effectiveness of this planning is possible, in face of the population growth of Brasília, showing a practically constant expansion over the years (Figure 5). The results indicate that, as Medeiros (2013) argues, the urban sprawl of Brasília stems from the strong predominance of the modernist school of thought in the elaboration of the planning of the Pilot Plan of Brasília. Unlike other planned cities, traditionally more compact and integrated, Brasília adopted as a core principle a rigid sectorization, structured in fragmentation. This resulted in an "urban form-space characterized by large voids and green areas between the surrounding cities and the Pilot Plan" (MEDEIROS, 2013).

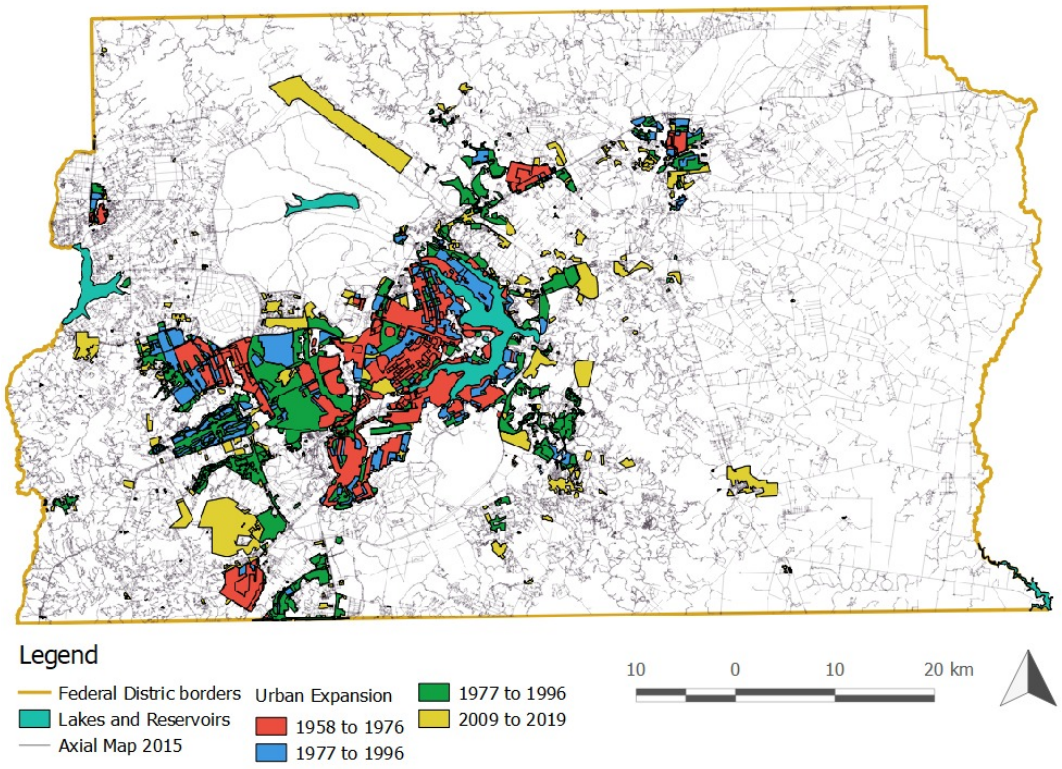
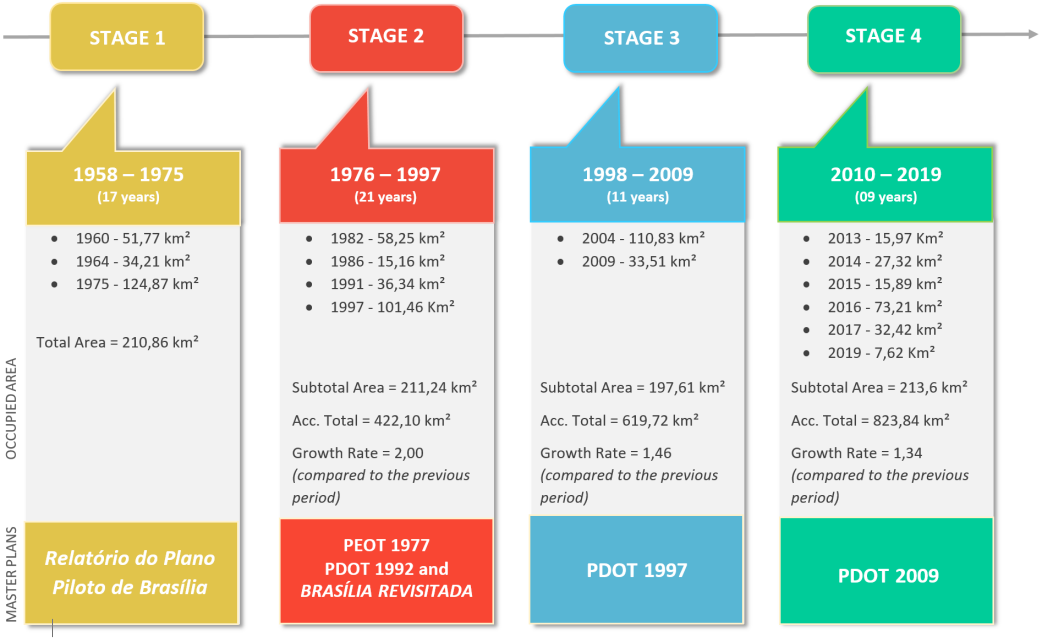


Figure 4: Mapping of urban expansion in the Federal District, pursuant to the 4 stages developed from the proposal by Paviani (2007).

Source: Coelho (2017) (axial map) and Geoportal (SEDUH), with adaptations.

Figure 5: Subdivision of the diachronic urban expansion of the DF in stages, and the urbanistic plans.



Source: Geoportal (SEDUH), with adaptations.

In the urban expansion process of the Federal District, the data obtained allow us to observe an initial moment of outright protagonism of the public power, especially in the first stage of analysis (1958 to 1975), with a total of 1,530.08 Km² of planned area for an occupation of 201.86 Km² (Figures 2 and 5). Obviously, the difference is also a product of the characteristics of the modernist implantation, conceived with large urban voids with isolated plots, or inserted between the blocks and housing complexes of the Pilot Plan and other localities of the time.

It is, in any case, a considerable quantitative difference, which denotes the strong performance of urban planning. As expected in new city scenarios, especially as a capital, there is a growth explosion in the DF in the first few years, read through Stage 1, stemming from the political desire of a fast implementation of the settlement in order to consolidate the transfer of the capital from Rio de Janeiro to Brasília. All these political maneuvers and the construction development attracted a significant number of inhabitants to the new urban core, something that was previously unforeseen. At this stage, the period from 1958 to 1964 is the richest in terms of planned area, but in number of projects the second phase from 1965 to 1975 stands out, especially in relation to the Pilot Plan, with 386 projects: Lago Sul with 67, Cruzeiro with 46, Taguatinga with 85, Gama with 63 and Ceilândia with 55 projects (Table 1). Regarding the Pilot Plan, the high number of projects is justified by the care in detailing the blocks, superblocks and other sectors.

In the subsequent stages this direction is lost, and the actions of the public power appear fragmented in the various Administrative Regions that emerge. The pace of projects drops significantly, including in relation to the Pilot Plan, given its consolidation. In the later stages, although occupation and population continue to expand, there is no longer the impact of transformation that the first two decades brought to a previously empty territory. There is a trend towards a decrease in the number of projects developed and the areas covered by them. In the last stage (2010 to 2019), for example, there are a total of 113 projects for the whole of the Federal District, corresponding to an area of 49.62 km², while in the same period, 213.12 km² of occupied area was recorded. This means that there is a gap of at least 163.50 km² of settlements that did not go through the official planning. Therefore, in recent years, what we have seen is public power acting in favor of regularizing settlements, considering their representativeness in the local scenario.

It was from the late 1990s and early 2000s that irregular urban occupation had a significant increase in the Brazilian capital, in a period guided by a policy of donating non-certified plots of land to humbler segments of the population, which resulted in political support. This established a relative incentive to state-sponsored informal occupation for the poorest and a tolerated informal occupation for the middle class in their new socio-spatial enclaves. Thus, the lack of planning fostered by the absence of actions by the State generates a whole informal urban structure. It is common knowledge that later there will be demands for land regularization

actions, which represent an incentive for the occupation of the territory. This regularization a *posteriori* is sometimes seen by politicians as a "good action" of the public power, legalizing areas that could have been previously planned, perhaps with more urbanistic quality.

3.2 Configuration

The second level of discussion of the results comprises a parallel between the findings of the present research and those obtained by Coelho and Medeiros (2019) (Table 3), dedicated to reading the diachronic transformation of Federal District at the configurational level (according to the Theory of the Social Logic of Space, or Space Syntax). The authors evaluated several configurational and non-configurational variables, including Connectivity, Global Integration (HH Rn), Normalized Integration Base 100, Synergy, Intelligibility, Normalized Angular Integration (NAIN), and Normalized Angular Choice (NACH), in order to explore issues of centrality, integration, and spatial segregation over time in Brasilia.

Table 3: Compilation of values for a diachronic analysis, according to the research variables.

Variables		Reference Year								
		1964	**1977**	**1986**	**2009**	**2015**	**2015r**	**2015u**	**2015uR**	**Brazil**
	Area (km²)	5,847.49	5,847.49	5,847.49	5,847.49	5,847.49	5,847.49	1,174.48	1,174.48	-
AXIAL	*Number of lines*	20,123	47,175	70,336	150,646	164,189	79,171	68,636	68,636	-
	Average size of lines (km)	0.286	0.232	0.215	0.165	0.160	0.197	0.183	0.183	0.290
	Compactness A (Lines/km)	3.441	8.068	12.028	25.763	28.079	13.539	58.439	58.439	94.800
	Compactness B (size of the lines/km)	0.983	1.874	2.583	4.256	4.498	2.662	10.718	0.011	18.100
	Average Connectivity	2.730	2.637	2.582	2.645	2.643	2.949	3.167	3.075	3.900
	Average Rn Integration	0.251	0.257	0.230	0.228	0.228	0.259	0.262	0.277	0.764
	Rn Integration Base100	55.509	56.654	56.716	57.409	56.887	58.579	58.981	54.582	47.280
	Average R3 Integration	1.404	1.351	1.302	1.361	1.360	1.501	1.683	1.650	-
	Synergy	0.330	0.297	0.281	0.215	0.207	0.225	0.090	0.062	0.360
	Intelligibility	0.043	0.038	0.039	0.027	0.026	0.030	0.008	0.005	0.150
SEG.	*Number of Segments*	37,965	85,341	122,637	275,125	299,669	164,807	157,792	157,792	-
	Average Segment Size	0.131	0.112	0.107	0.078	0.075	0.083	0.070	0.070	-
	Average NACH	0.852	0.834	0.826	0.798	0.795	0.823	0.800	0.778	-
	Maximum NACH	1.545	1.553	1.549	1.570	1.571	1.575	1.571	1.590	-

	Average NAIN	0.640	0.701	0.663	0.713	0.711	0.756	0.775	0.654	-
	Maximum NAIN	1.036	1.163	1.094	1.202	1.202	1.276	1.202	1.093	-

Source: Coelho and Medeiros (2019).

The values referring to Global Integration and Normalized Angular Integration (NAIN) comprise measures of centrality and relate to the accessibility of the systems, highlighting the roads (axes or segments) that are more easily reachable from the others. Regarding the measures, Coelho and Medeiros (2019) identify slight alternating rises and declines for the interval from 1964 to 2015, so that the performance can be understood as stable, which apparently could be judged as positive, considering the size of the federal capital. The result, however, is contrary to what one would expect since the DF system already had a structured network of paths since its first years of implementation. Thus, at first, this network would be progressively filled, which would imply increasing the value of the variable. The findings obtained in this study help in the understanding of this performance by proving that the increases in terms of occupation in the Federal District, planned by the Public Power or not, have often relied on solutions based on isolated settlements, producing a fragmented territory. Moreover, the gated communities also contributed (VIANA, 2005; FREITAS, 2013), since they promoted the filling of the territory, with little improvement to the accessibility of the path network due to their single accesses.

The values found by Coelho and Medeiros (2019), therefore, can be correlated with the data presented in Figure 2, which shows a sharp drop in the area of urban planning projects from 1975 onwards. The absence of the Public Power could be pointed out as a possible cause of the growing protagonism of private initiatives in the production of urban space in the DF, which occurred from that period onwards. The repercussions of the process can be seen to this day in the series of regularizations of informally occupied areas that have been consolidated since then. It is worth noting that in 1997 the area referring to urban occupation exceeded that resulting from official planning in Brasília. The point is that the settlements promoted by private initiative, without adequate supervision by the public authorities, often arise without a coherent articulation with the adjacent pre-existing urban fabric, and even less so when the global scale of the territory is observed.

When observing the Normalized Integration values for the Base 100, which has the function of minimizing the differences in the size of the systems over time, the tendency towards stability of the measures is confirmed and reveals itself even greater, with an almost horizontal line, pointing towards an evident constancy. This trend towards stability in the system is also observed when elaborating Figure 3, which presents the values cumulatively represented for the urban occupation and the planning area. The results reinforce the reading that the filling of the Federal District territory occurred following a pattern that, instead of improving the articulation between

parts, ended up reinforcing a segregating design, characterized by zoning, distancing of social groups, and by large voids.

As for Connectivity, also an indicator of the accessibility of the system, (since the more connected the urban network, the greater the number of routes and paths to be traveled, i.e., there is more possibility of fluidity), the variation in the measure is not significant over time. This aspect seems to result from the great fragmentation of the territory that remains constant, in addition to the permanence of the pattern of settlements on islands, that is, areas not strongly connected to the surroundings or dependent on few access roads, preventing greater variability in the routes.

A similar conclusion was reached in this study, represented in Figure 4, in which it is possible to see the great dispersion of urban occupation in the Federal District, largely occurring in the form of gated horizontal condominiums, especially in Planaltina, following to the southeast axis in Sobradinho, East Altiplano, Jardim Botânico, reaching Tororó. Similarly, this type of occupation can be found near the region of Ponte Alta do Gama, towards Santo Antônio in the Setor Habitacional Água Quente, Incra 9 and Lago Oeste, Vicente Pires and Arniqueiras. As these subdivisions are usually private developments, some approved by the government, others not, usually in more peripheral and disconnected areas, they appear as gated communities whose enclosure is sold as a safety measure to off-set their self-isolation.

One of the effects of the scenario described in the previous paragraphs is the impairment of legibility, which affects the understanding of the city. For this level of interpretation, two measures are of interest: Synergy and Intelligibility. For Synergy, evaluated from the correlation between Local and Global Integration of the system, Coelho and Medeiros (2019) record a gradual drop in values in the diachronic reading for Brasilia. The trend coincides with the expansion of the system, but that can also be attributed to the new settlements added without major concerns about their interconnection with the preexisting urban fabric. Such condition is identified in this research in the significant sprawl of the city towards the limits of the Federal District in the last Stage of analysis.

Intelligibility, which represents the ordinary citizen's ability to orient themselves and move around within a system, is measured by the correlation between Global Integration and Connectivity. A good performance means that the most integrated routes are also the most connected. The higher the Intelligibility values of a system, the greater its readability. Systems with more regular grids, geared towards the chessboard pattern, may be more readable than more organic systems (MEDEIROS, 2006), depending on the degree of repetitiveness of the grid. In the case of the Federal District, intelligibility has been dropping with its urban expansion, which reinforces the effect new settlements for perception, making the system more confusing. Examples are in informal areas like Vicente Pires and Arniqueiras, which present networks of

paths without an easily apprehensible hierarchy. This is a snapshot of the absence of official planning in the construction of a more hierarchical system, generating clarity in the city spaces and affecting the possibilities of displacement.

As for the Normalized Angular Choice (NACH) measure, which points out the probability of roads or road segments being chosen as a path, with values obtained from the map of segments, Coelho and Medeiros (2019) find a scenario of slight decline between 1964 and 2015, resulting in a drop of 0.057. The finding dialogues with the previous ones and reinforces that an increase in urban occupation does not necessarily imply greater possibilities of routes in the Federal District, positively affecting the configurational performance. In other words, filling the voids in the territory, depending on the patterns adopted, will reinforce segregating scenarios. In the Federal District, the historical option for disconnected settlements and the significant presence of gated communities explains the performance of the measure. For example, the DF 001 road remains the only alternative route connecting some peripheral settlements (Jardim Botânico, Mangueiral, São Sebastião and part of Lago Sul) with the central region of the Pilot Plan, causing overloading on the road during peak hours due to the lack of alternative routes to meet the commuter movement needs.

From the analysis of the configurational data, it can be interpreted that the diachronic increase of planned and informally occupied areas did not provide the expected improvement in terms of accessibility from the filling of the voids, despite the *sui generis* issue of the Federal District having already been created with its boundaries defined and with a network of paths schematized on the territory. This is attributed to the low connection between parts of the emerging settlements, due to the segregationist characteristics of the subdivision implementation models, both for the fencing of vast condominium areas and for the urban morphology that equally isolates the fractions, creating islands that do not relate to their surroundings.

The syntactic reading associated with the understanding of planned and unplanned occupations also allows us to see the effects of the so-called "morphological mosaic" of Brasília, according to the concept adopted by Kohlsdorf (1985), which highlights the existence of distinct patterns in the urban territory of the Federal District. For the author, there is a remarkable variety of patterns in the federal capital, which results in several morphic types. The issue is that these types are weakly articulated amongst themselves, lacking consistent seams with the immediate surroundings, which results in "morphological islands" that section the city - which dialogues with the problem of stability of the syntactic variables analyzed.

4 CONCLUSIONS

This research sought to discuss the role of urban planning in the Federal District, a city planned from the beginning, and its repercussion on the effective occupation of the territory. The survey of available data referring to the city historiography and official documents pursuant to the topic

were used for the diachronic reconstitution of the steps taken by one actor (official planning) and another (formal or informal occupation). SISDUC and Geoportal were the basis for the survey of projects and for the maps.

In the course of the analyses developed for this study, some aspects stood out, such as the fact that, since the beginning of the Federal District's urban planning, the centers in the periphery of the Pilot Plan were planned and implemented because of previous popular pressure for housing. Even the neighborhoods/cities that were totally created *ex-nihilo*, especially those designed for less favored social classes, came to be because of this type of action. According to Medeiros and Campos (2010), in the first moment of the capital's implementation, the logic of the State predominated, where it is the main actor that makes urban organization possible, acting on several fronts. Later, the State gradually gives way to the market as a definer of new urban additions, which causes more inequalities and social segregation. In parallel, the need for housing arises for groups or individuals who settle in the territory and contribute to this urban effervescence to be managed by planning. It is noteworthy that the urban occupation sometimes coincided with what was planned, i.e., it happened within the limits of the urban settlements previously approved by the competent authority, however, in several cases it happened in places not originally envisioned by the official urban planning.

This situation has been perpetuated ever since, in the history of Brasília, with new centers added to pre-existing ones without clear articulation, which reinforces, involuntarily or voluntarily, the socio-spatial segregation in relation to the Pilot Plan. The literature consulted and the results obtained show that segregation occurs since the beginning of the settlement's occupation, due to the high costs of living in the Pilot Plan. However, with the opening of new roads and a greater availability of cars and other technologies, the middle class joins this movement, prioritizing self-segregation by opting for housing in more noble areas of the surroundings (GOMES, 2012). This intention is supported by the opportunity to live closer to bucolic places, close to nature, not so far from the Pilot Plan, and with the feeling of greater safety, usually in gated communities (SILVA, 2016). In this scenario, urban planning continues to promote not only spatial segregation but also social segregation. In part, this is due to the continued insistence on designing developments geared towards a certain income bracket, creating the stigmatization of certain places.

On the eve of the PDOT review, it is crucial to revisit the issues raised, seeking on the one hand to resume the protagonism of the public power as manager of the territory and, on the other hand, to embrace the need to review paradigms that have persisted since the modernist influence in the development of projects for Brasília. As Coelho and Medeiros (2019) point out, the focal point of urban planning has always been tied to the preservation of the Pilot Plan and the demarcation of the expansion zone provided for in the master plans. The new axes of urban expansion were a consequence of the consolidation of informal occupations, and the result of a lack of actions by

the public power, since it was apparently not possible to anticipate the informal land occupation. The State is then left with the responsibility of adapting to a *de facto* situation which, according to the authors, corroborated by the present research, reveals a difficulty in foreseeing the possibilities for urban expansion in the territory. Likewise, it is important to review the excessive sectorization in governmental projects. These projects should seek to devise actions to meet the needs of different social classes mixed together in the same neighborhoods, in a more accessible and integrated urban fabric.

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