

THE PUBLIC OPEN SPACES OF THE METROPOLITAN REGION OF BELO HORIZONTE (MG): WEST VECTOR CONURBATION AREA

OS ESPAÇOS LIVRES PÚBLICOS DA REGIÃO METROPOLITANA DE BELO HORIZONTE/MG: ÁREA CONURBADA DO VETOR OESTE

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ABSTRACT

This study presents an overview of a research project conducted by the UFMG - School of Architecture, Landscape Laboratory, regarding its participation in the national network of the Quapá project. The emphasis is on the current discussions about open spaces on the outskirts of the conurbation area of Belo Horizonte/MG; the North Vector analysis had already been carried out, and the West Vector's is currently in development process. The stages of the research begin with the bibliographic and documentary review, followed by a survey and prior identification of typologies of open spaces in the conurbation area, once again followed by a field trip to confirm the areas and, finally, the triangulation of the information and results.

Keywords: Urban form. Open space of public use. Conurbation area of Belo Horizonte Metropolitan Region.

RESUMO

Este estudo apresenta um panorama geral das pesquisas desenvolvidas pelo Laboratório da Paisagem da Escola de Arquitetura da Universidade Federal de Minas Gerais em relação à participação na rede nacional do projeto Quadros do Paisagismo no Brasil. A ênfase está nas discussões atuais sobre os espaços livres das bordas da área conurbada de Belo Horizonte (MG), para as quais já foi desenvolvida a análise do Vetor Norte e, em processo de execução, a do Vetor Oeste. As etapas da

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pesquisa se iniciam com a revisão bibliográfica e documental, sequenciada pelo levantamento e pela identificação prévia das tipologias dos espaços livres da mancha conurbada, seguida do trabalho de campo para confirmação das áreas e, por fim, a triangulação das informações e os resultados. Palavras-chave: Forma urbana. Espaços livres de uso público. Área conurbada da Região Metropolitana de Belo Horizonte.

1 INTRODUCTION

Cities are made up of built environments and spaces free of buildings, all of them interconnected, which change over time. Often, the urban form is derived from urban planning policies; sometimes, the occupation occurs indiscriminately and without clear rules, which generates precarious urban settlements. Historical and economic factors are perhaps responsible for the formation and the process of urban expansion, which in general is not restricted to the geopolitical boundaries of municipalities. In metropolitan regions, for example, it is a recurring fact that the urbanized area exceeds these limits, which leads to the formation of conurbations that encompass several municipalities.

The conurbation is understood as the urban fabric of two agglomerations that expand in converging directions, culminating in the process of a single large urban area formation. It is the formation of this phenomenon that characterizes the urban landscape of Belo Horizonte and its relationship to the adjacent municipalities. In this context of urban conurbation areas, it is our intention to investigate the system of open spaces and their relationship to the urban form. It is understood that urban open spaces play important roles in the urban context, such as allowing gatherings to be held, circulation and, in this sense, they are as important as the built environment in the urban structure. (DEL RIO, 1990 apud MACIEL et al., 2014, p. 4).

The research developed at the Laboratory of Landscape of the School of Architecture of the Federal University of Minas Gerais (LAP UFMG) is part of a national network of studies on the urban landscape, centralized by the *Quadro do Paisagismo no Brasil* project (Quapá – Landscaping Panorama in Brazil), Department of FAUUSP, which has been developing the project since 1994.

The Belo Horizonte core has worked on the project with several research projects developed since 2008, considering the specific approaches to the different scales of analysis and also the varying degrees of depth, depending on the more or less real possibility of obtaining information. Thus, the following research has already been carried out: “The Free Space Systems and the Establishment of the Contemporary Public Sphere in Brazil – Quapá-SEL”, implemented at the term of the Public Notice 01/2006 Universal FAPEMIG; “The Morphological Type Elements of the Metropolitan Borders of Belo Horizonte”, implemented at the term of the Public Notice 01/2009 Universal FAPEMIG; and “Systems of Open Spaces and Urban Form of Brazilian Cities Nowadays – Quapá-SEL II”, implemented at the term of the Public Notice 01/2011

Universal FAPEMIG, focusing on the Northern Vector of the metropolitan region of Belo Horizonte (RMBH). Currently, the research being developed is “Systems of open spaces and urban form of Brazilian cities nowadays – Quapá-SEL II: Western Vector of the Metropolitan Region of Belo Horizonte/ MG”, implemented at the term of the Public Notice 01/2013 Universal FAPEMIG.

The project “Systems of Free Spaces and the Establishment of the Contemporary Public Sphere in Brazil” seeks to identify the free spaces systems of contemporary Brazilian cities and the establishment of the public life sphere related to them. The objectives comprehend furthering discussions on open spaces existing in towns and cities; analyzing these spaces as representatives of the urban cultural life condition; examining how urban public authorities act in relation to them; building an interpretive framework of the Brazilian urban contemporaneity from the link between open spaces and public life. This project is developed with the participation of several laboratories and research groups from public and private higher education institutions from all regions of the country.

The research conducted in Belo Horizonte raised the main aspects about the systems in general and their application on the landscape concept. The result is the sum of knowledge, effort and dedication of all the members of the Landscape Laboratory team, coordinated by Staël Alvarenga Costa Pereira, PhD. This work was a professional and scientific experiment of the associated researchers, professors Maria Cristina Teixeira Villefort, PhD and Marieta Cardoso Maciel, PhD.

In the Quapá-SEL II research core in Belo Horizonte, the different types of free spaces were identified, mapped and the system of existing urban open spaces established. Ecological potential for conservation of natural resources and the balance of natural processes in the urban area were all based on contemporary concepts of landscape.

This article presents the research “Systems of Open Spaces and Urban Form of the Brazilian Cities Nowadays – Quapá-SEL II”, in which free spaces and their relationship to the urban form of the metropolitan region of Belo Horizonte are identified. From this analysis of open spaces, the aim is to build a methodological framework of relations between free spaces (public and private), the built environment (public and private) and the urban form of Brazilian cities nowadays. Therefore, it is assumed that the free spaces can be considered structural elements of the shape of the city. Thus, the overall objectives in this projects are:

- investigate the relationship between the free space systems and the production of urban form;
- analyze the relevance of planning the fundamentals of the open spaces system and their sufficiency for the understanding and proposition of the complex contemporary urban context of the city;

- investigate the conceptual understanding basis of open spaces;
- on a national level, contribute to the development of the general policies principles, plans and the implementation of free spaces with special attention to the heterogeneous Brazilian urban reality;
- build a method of reference for the quantitative and qualitative analysis of the relationship between open spaces and urban form;
- establish criteria for evaluating these relationships.

The specific objectives are:

- analyze the distribution of open spaces system in the conurbation area of each vector in the Belo Horizonte metropolitan region according to environmental variables, landscaping, legal and urban structure;
- define the type of open spaces identified in the conurbation area of the vectors in the Belo Horizonte metropolitan region;
- develop, on a local level, the general policies principles, plans and implementation of free spaces, being more attentive to the heterogeneous urban reality of the conurbation area in the Belo Horizonte metropolitan region;
- consolidate the core of the landscape studies in the Belo Horizonte metropolitan region.

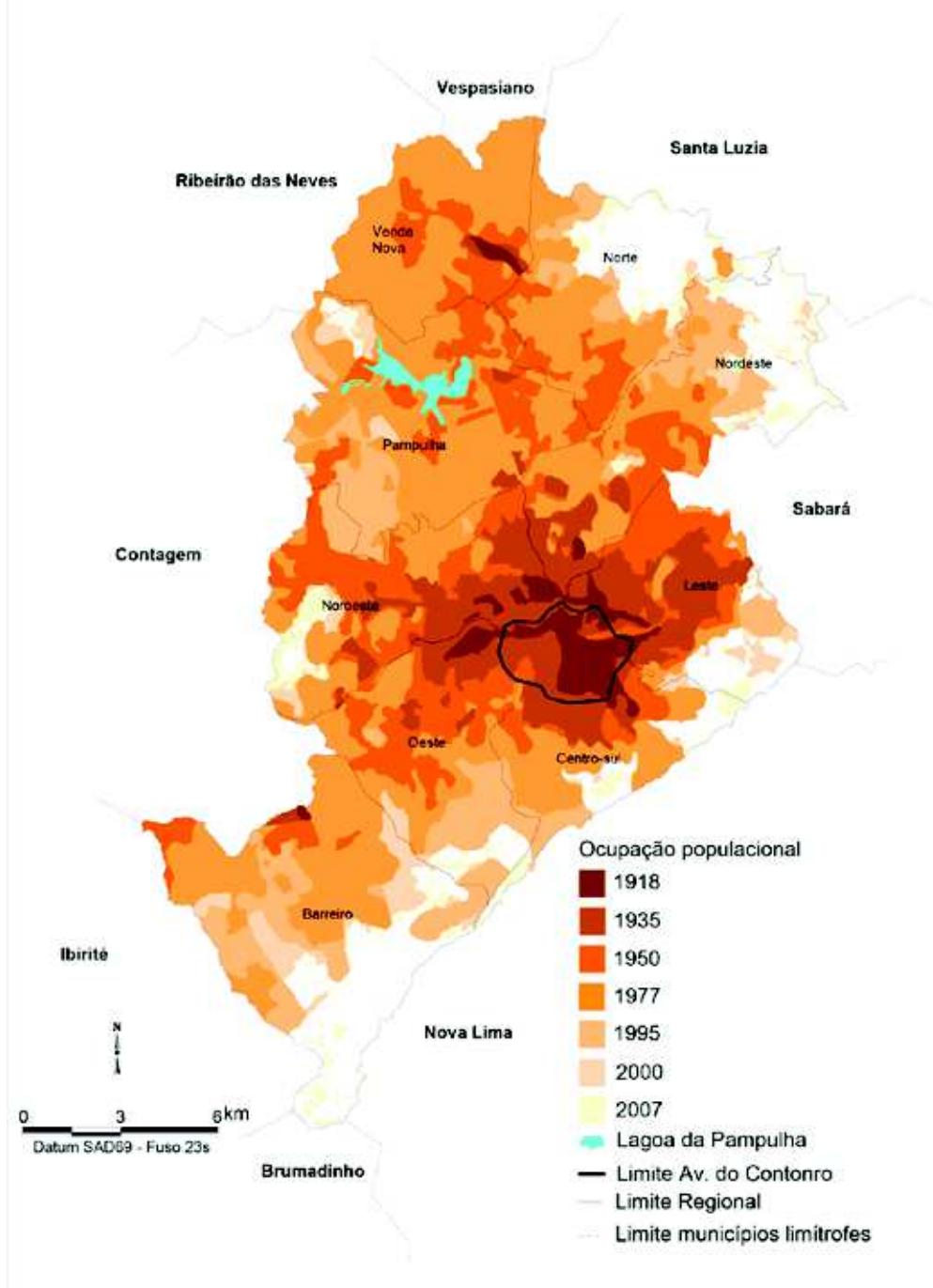
2 URBAN STRUCTURE OF BELO HORIZONTE IN 2015

The city of Belo Horizonte was structured by Aarão Reis' 1895 plan, with a ring that surrounded the urban area around which were established the residential and administrative activities. The main symbolic axis of the new capital was laid out place in the north and south direction, centralized by praça Sete de Setembro (a square), which also connected to the road axis in the east - west direction. Currently, this square plays the main central role, along with the large area of its surroundings, classified as the metropolitan hyper-center. Two other centers are located in the western and northern regions, in Barreiro and Venda Nova, respectively.

Almost the entire territory of the municipality is already occupied (picture 1), mostly for residential use. The residential occupation also occurs in the extreme southern portion of the municipality, in areas of average declivity forming larger units, deployed in plots of large dimension and low occupational density. In areas of steep declivity and on the banks of watercourses there is ownership by the low-income population and these constitute the favelas, with occasional occupation scattered over the urban area.

The city's main transportation axes are the West and North Vectors upon which are implanted the highways and the railway, consolidated since the implementation of

Evolução da Mancha de Ocupação Populacional Belo Horizonte - 1918-2007



Picture 1 Map with the evolution of the urban land occupation of Belo Horizonte (MG), between 1918-2007. Source: Prefeitura de Belo Horizonte (PBH). Available in: <http://portalpbh.pbh.gov.br/pbh/ecp/comunidade.do?evento=portlet&pIdPlc=ecpTaxonomiaMenuPortal&app=estatisticaseindicadores&lang=pt_BR&pg=7742&tax=20038>. Accessed May 28th, 2015.

the capital. The axes of urban expansion on the west lead to the industrial area and are the main expansion vectors consolidated since the construction of the industrial park in the 1930s. It is also observed that the expansion to northern sector of the city, induced by the implementation of limestone extractive industries for cement production, in the 1960s, were reinforced by the construction of the international airport in the 1980s and the administrative city of the state government in 2010. Along this axis, occupation by condominiums intended for both high and low income populations are also observed.

Other axes of located in the northwest and northeast direction are potential inductors of peripheral occupations and shelter for the low-income population. The south expansion axis consisted of the highway Belo Horizonte – Rio de Janeiro (BR-040) is, in the vast majority, appropriated by single-family homes gated communities for high purchasing power families.

Public open spaces are scattered about the urban area and the largest ones are located at Serra do Curral, acting as barriers to the urban sprawl being classified as environmental conservation areas. Picture 2 summarizes the situation of the city's urban structure in 2015.

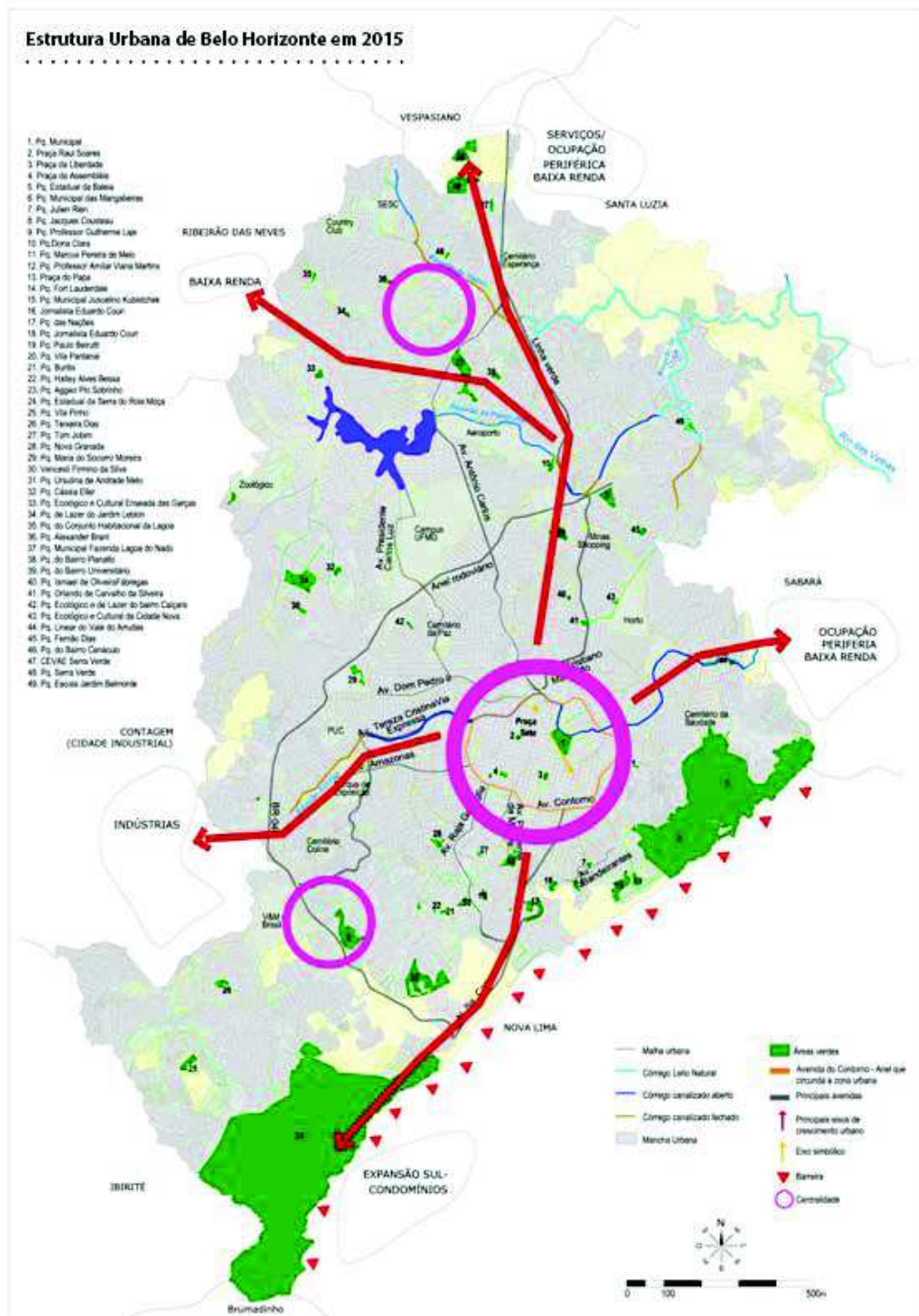
Since its inauguration in 1897 until 2010 Belo Horizonte has undergone significant changes in its physical space that reflect the socioeconomic, political and cultural processes that occurred throughout its history. It is thus claimed that these processes point to the government's disregard for public open spaces; at first, with the occupation and channelization and/or piping of streams, later with the low implementation rate, protection and creation of "green areas" and, finally, treating them as residual areas in the urban fabric.

Through these reviews it is clear that the relationship between open spaces and the impact generated by the implementation of an avenue is immediate. The avenues created after streams are channelized and/or piped are examples of how the government solves urban problems, without taking into account the environmental and social aspects of these free spaces, earlier in their natural state.

It has been found that in the 1988-2010 period the implementation of parks and squares had a considerable increase and the presence of these spaces permeates all areas of the city. This fact is probably due to the environmental crisis in recent years and to the population's participation in decisions concerning the administration of the city, increased by the demand for laws. However, it is clear that there has never been the intention to structure them as a system, considering their fragmentation throughout the city.

With the advancement of the metropolization process and the enactment of the Federal Supplementary Law No. 14 of 1973, metropolitan areas were defined and, among them, the metropolitan region of Belo Horizonte. Currently it consists of 34 municipalities and the total population is 5.8 million inhabitants. (IBGE, 2010).

The Public Open Spaces of the Metropolitan Region of Belo Horizonte (MG):
West Vector Conurbation Area



Picture 2 Map of Belo Horizonte's urban structure in 2015.
Source: Organized by LAP UFMG team, 2015.

These municipalities are: Baldim, Belo Horizonte, Betim, Brumadinho, Caeté, Capim Branco, Confins, Contagem, Esmeraldas, Forest, Ibirité, Igarapé, Itaguara, Itatiaiuçu, Jaboticatubas, Juatuba, Lagoa Santa, Mário Campos, Mateus Leme, Matozinhos, Nova Lima, Nova União, Pedro Leopoldo, Raposos, Ribeirão das Neves, Rio Acima, Rio Manso, Sabará, Santa Luzia, São Joaquim de Bicas, São José da Lapa, Sarzedo, Taquaraçu de Minas and Vespasiano.

Due to the extension of the urban conurbation, the area was divided up into regions. Starting from the North Vector (the research was completed in March 2014). Following that, the investigation of existing open spaces in the West Vector of Belo Horizonte's conurbation area is now under way, through a qualitative and quantitative analysis. In the future, the open spaces of the southern and eastern vectors of the urban conurbation area will be analyzed.

3 METHODOLOGICAL PROCEDURES

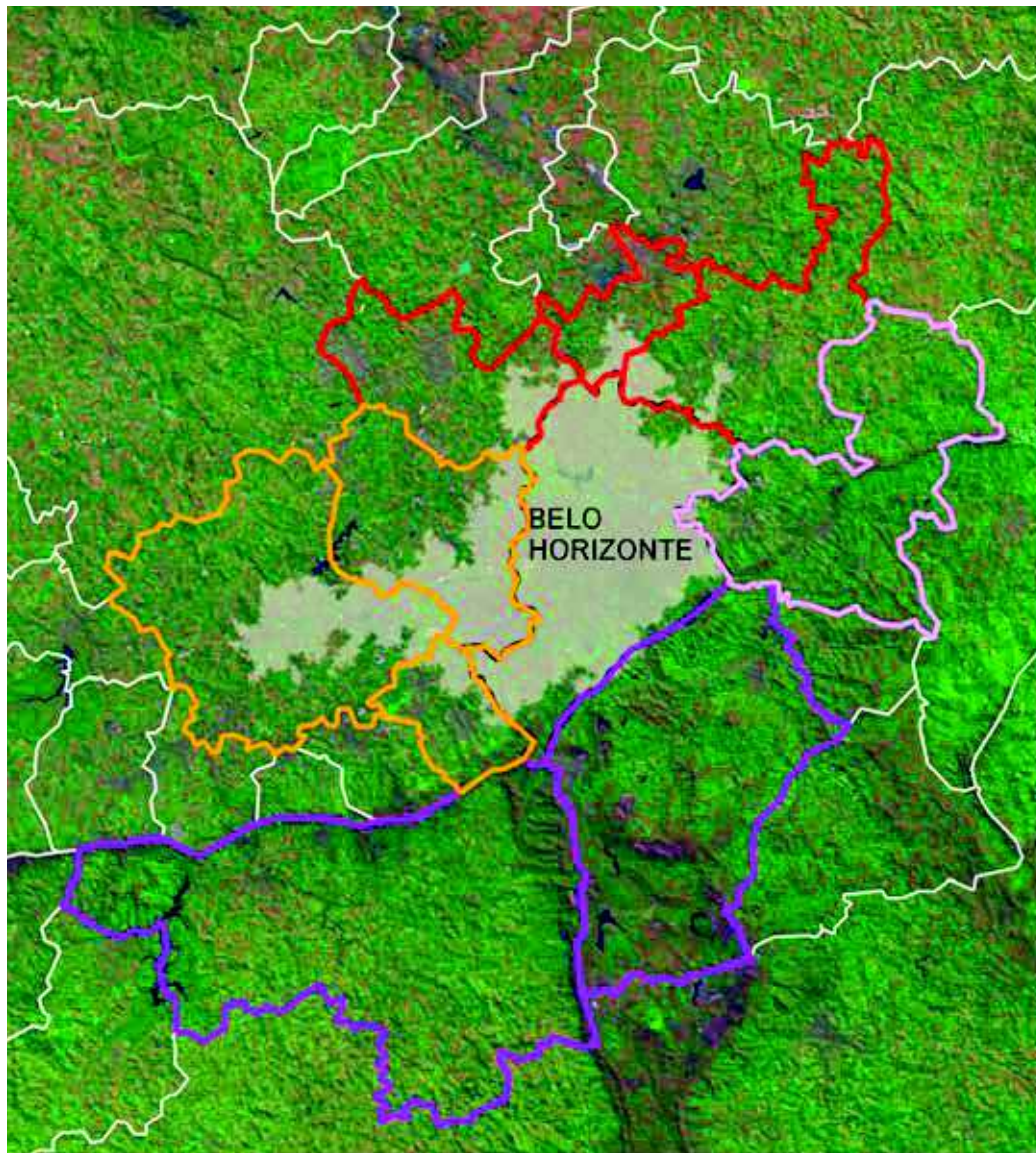
The survey of existing open spaces in the conurbation area of Belo Horizonte metropolitan region is divided into three steps:

- bibliographic review for theoretical foundation and documentary research: current urban planning and environmental laws that regulate the Belo Horizonte metropolitan region (BHMR); documentary data of local and state agencies are collected (Metropolitan Planning Agency (AMP), State Forestry Institute (IEF), João Pinheiro Foundation (FJP), Environmental Policy Council (COPAM), among others); for the launch of georeferenced, surveyed data on maps, the specific software such as ArcGIS, AutoCad, QGIS and an upgrading of open spaces by Google Maps are used;
- field survey for on-site knowledge, checking on the application of laws, data compatibility and final results;
- tabulation, analysis of collected data in the field survey, reporting and production of texts.

From the classification of types of open spaces identified on maps, the second stage starts: field survey with visits to areas identified by the photographic survey and analysis of the types of open spaces. The tabulation, analysis of data collected in the field survey, reporting and production of texts is the third and final stage.

The research focuses on open spaces and their relationship to the urban form of the conurbation area of each vector in the Belo Horizonte metropolitan region. Picture 3 shows the extent of the conurbation area and the vectors analysis division.

In Belo Horizonte, the urban area stretches for almost the whole city, the reason why the analysis was restricted to the planning units (PUs) – spatial divisions of the city of Belo Horizonte as defined in the Master Plan of 1996 – which border the studied cities.



Legenda

- VETOR NORTE
- VETOR OESTE
- VETOR SUL
- VETOR LESTE
- MANCHA URBANA CONURBADA

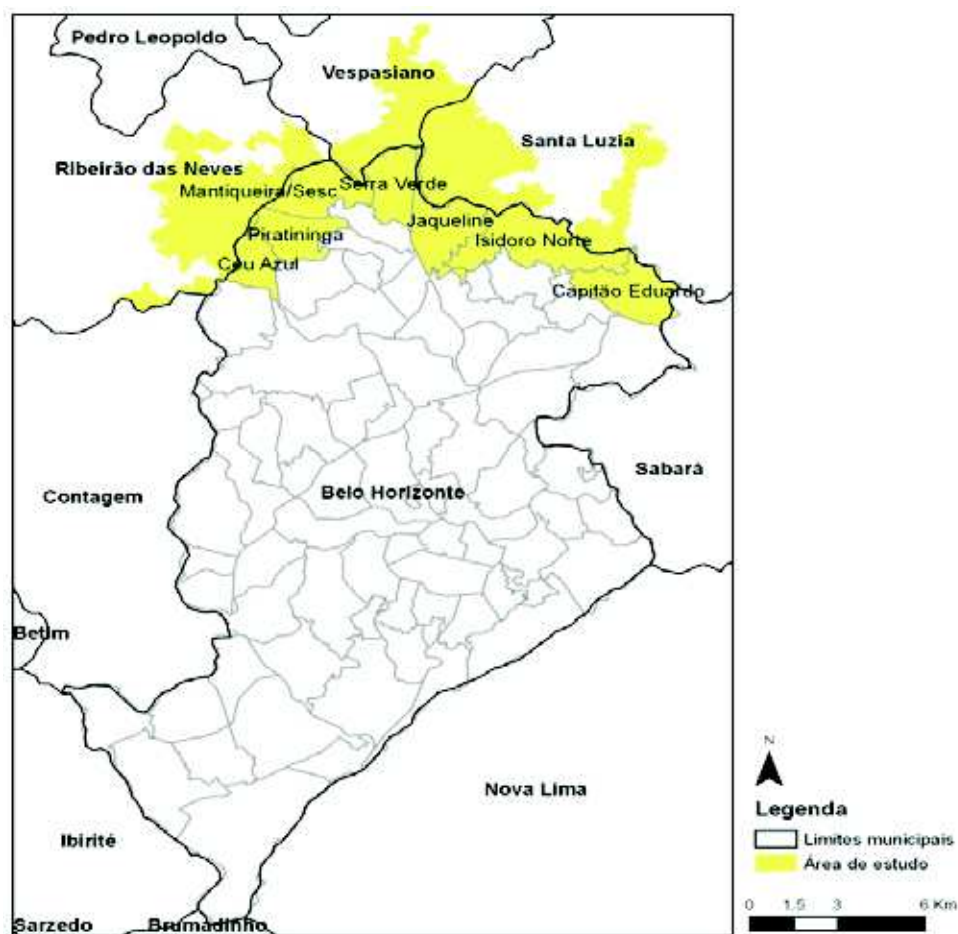


0 5 10 15 20 km



Picture 3 Satellite image with the urban conurbation of the metropolis (PDDI, 2011) and demarcation of study vectors.

Source: Google Earth Pro – Adapted by LAP UFMG team, 2015.

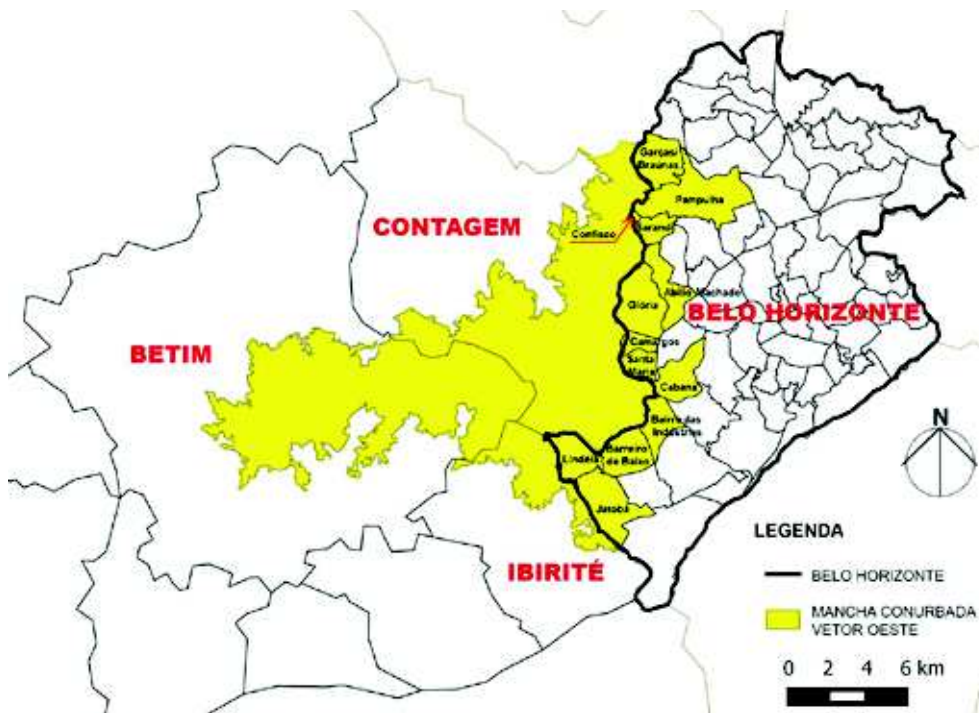


Picture 4 Delimitation of Northern Vector study area in relation to Belo Horizonte metropolitan area. Source: Organized by LAP UFMG team, 2013.

In the first study, the free spaces in the conurbation area of the Northern Vector were analyzed, containing part of Ribeirão das Neves and Santa Luzia (municipalities), Vespasiano and Belo Horizonte's planning Units: Céu Azul, Piratininga, Mantiqueira, Serra Verde, Jaqueline, Isidoro Norte and Capitão Eduardo (picture 4). The total selected area is approximately 87 km².

The current research of the Western Vector covers the towns of Betim, Contagem and Ibirité, in addition to Belo Horizonte's planning units neighboring areas, namely: Graças/ Braúnas, Pampulha, Confisco, Sarandi, Abílio Machado, Glória, Camargos, Santa Maria, Cabana, Bairro das Indústrias, Barreiro de Baixo, Lindéia and Jatobá (picture 5). The territorial dimension of the selected areas belonging to the four municipalities in the study corresponds to approximately 241 km².

The research started off with bibliographic and documentation review, data collection from satellite images and relevant legislation, allowing a partial assessment of the location of open spaces. The next stage consists of classification of areas:



Picture 5 Delimitation of the Western Vector study area in relation to Belo Horizonte metropolitan area.
Source: Organized by LAP UFMG team, 2015.

property (public and private) and physical and biological characteristics. In the future, we intend to apply the same research methodology to the Southern (Brumadinho and Nova Lima) and the Eastern (Sabará) Vectors, which will complete the whole conurbation area of the Belo Horizonte metropolitan region.

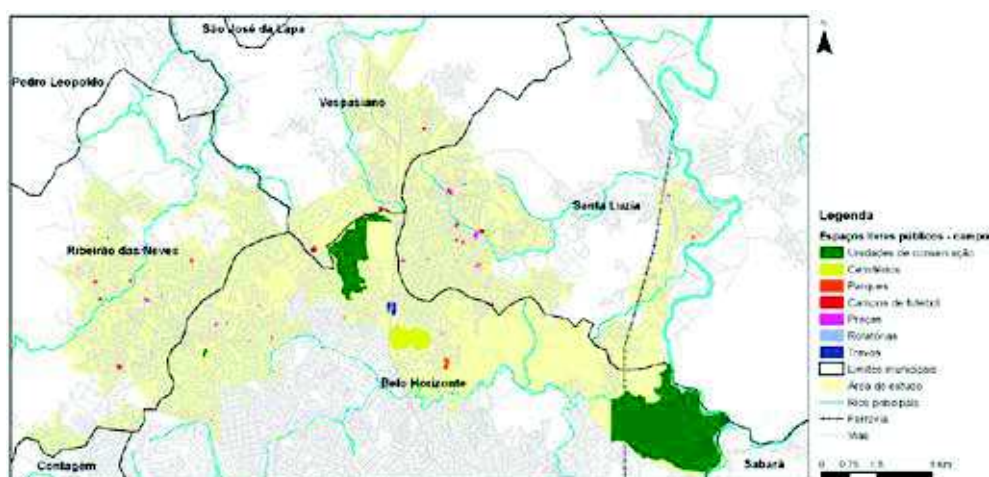
4 PARTIAL RESULTS OF THE NORTHERN VECTOR OF BELO HORIZONTE METROPOLITAN REGION

Picture 6 shows the synthesis map with the identification of public open spaces of the Northern Vector of the conurbation area of Belo Horizonte metropolitan region produced after the field survey and triangulation of data. One can observe that 8.54% (7.5 km²) of the study area (87 km²) is equivalent to the open spaces categories and, considering the division by municipalities, Belo Horizonte concentrates 97.2% of the public open spaces' total area, while Ribeirão das Neves, Santa Luzia and Vespasiano have, respectively, 0.9%, 1.5% and 0.4% of the area corresponding to these spaces.

Regarding the typology of public open spaces, the conservation units, which are concentrated in Belo Horizonte, correspond to 88.3% (6,57 km²). The other typology that had a major representativeness in the area was the "cemetery", also located in

Belo Horizonte with equivalent area of 0.5 km² (7.1% of total public open space area). As for the number of elements identified by the municipality (table 1), out of the 83 areas identified, Belo Horizonte has 33 units, while Ribeirão das Neves and Santa Luzia have respectively 20 and 25 public open spaces. Vespasiano, however, has only 5 units.

The typology “square” was the one that recorded the highest number of units, despite the fact its area corresponds to only 1.3% (0.1 km²) of the total. From each free open space’s total area, Belo Horizonte concentrates 100% of the areas of conservation units, cemeteries, parks and cloverleaf interchanges. Whereas, regarding the squares, 51% of the areas of this typology are located in Santa Luzia, as well as 45% of the areas of football fields.



Picture 6 Public free spaces map identified in Northern Vector study area, from field survey. Source: Organized by LAP UFMG team, 2014.

Table 1 Number of typological elements of free public open spaces identified by county, in the Northern Vector after field survey

Typologies of open free public spaces	Number of elements by county				
	Belo Horizonte	Ribeirão das Neves	Santa Luzia	Vespasiano	Total
Squares	12	11	13	1	37
Roundabouts	11	3	3	1	18
Conservation units	3	0	0	0	3
Football fields	1	6	9	3	19
Cemeteries	1	0	0	0	1
Parks	1	0	0	0	1
Cloverleaf interchanges	4	0	0	0	4
Total	33	20	25	5	83

Source: Organized by LAP UFMG team, 2014.

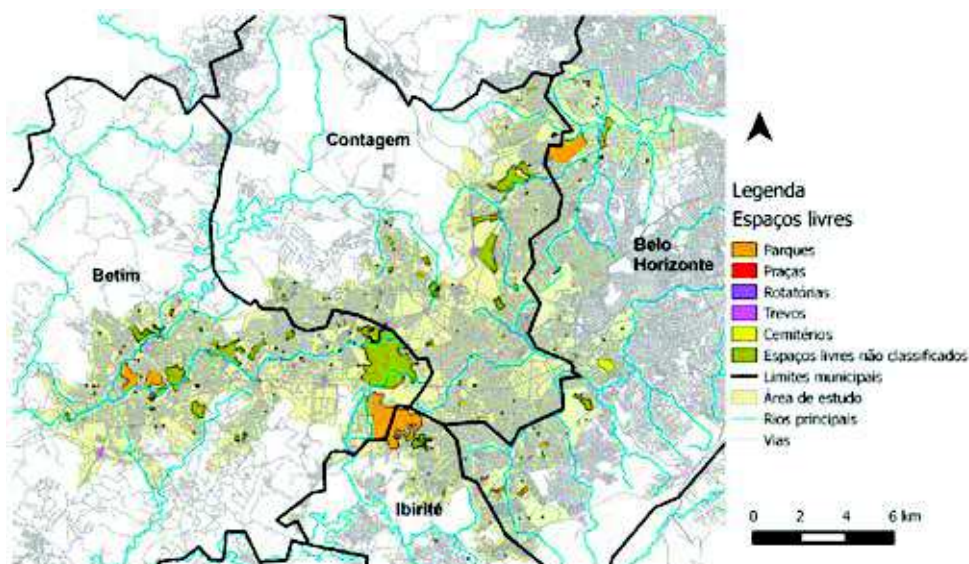
5 PARTIAL RESULTS OF THE BELO HORIZONTE METROPOLITAN REGION WESTERN VECTOR SURVEY

Regarding the previous survey of the Western Vector, the following free spaces have been identified: parks, squares, roundabouts, cloverleaf interchanges and cemeteries. Picture 7 and table 2 show that the number of demarcated areas is much larger than it has been mapped on the Northern vector and these many have not been classified due to a lack of official information provided by municipalities, which was confirmed by the field survey.

Table 2 Number of typological elements of free open spaces identified previously, by county, in the Western Vector

Typologies of open free public spaces	Number of elements by county				
	Belo Horizonte	Betim	Contagem	Ibirité	Total
Squares	134	55	61	12	262
Roundabouts	18	12	17	2	49
Cemeteries	1	0	1	0	2
Parks	8	3	2	3	16
Cloverleaf_interchanges	3	35	19	0	57
Not classified	43	99	59	13	214
Total	207	204	159	30	600

Source: Organized by LAP UFMG team, 2015.



Picture 7 Map of free open spaces previously identified in the Western Vector study area based on satellite images.

Source: Organized by LAP UFMG team, 2015.

Based on the dimensions of the study area, calculations of areas by typologies and by counties have not yet been completed. However, in quantitative terms, Belo Horizonte has most of the open spaces for public use, with a considerable predominance of squares. The city also has the largest number of parks, as well. Most of the spaces not yet classified are in Contagem, followed by Betim, with most of the cloverleaf interchanges, which is justified by its extensive road network.

6 FINAL CONSIDERATIONS

This article aimed to present quantitative research on the public open spaces of the conurbation spot in the Belo Horizonte metropolitan region – RMBH. The work started from the Northern Vector and the heterogeneity of its spatial distribution was observed. The highest concentration of public open spaces is located in the area corresponding to the city of Belo Horizonte (97.2%). Areas equivalent to the municipalities of Ribeirão das Neves, Santa Luzia and Vespasiano, however, contribute less than 3% of the public open spaces identified. It is important to point out that the municipal administrations of Ribeirão das Neves, Santa Luzia and Vespasiano have limited capacities within their laws for the protection of free spaces in their territory, both in urban and rural areas.

In the final report of the Northern Vector's research, the elaboration of a master land usage plan with adequate implementation and monitoring instruments is suggested, with a view to the preservation and expansion of public open spaces (squares and parks) and Permanent Protection Areas APPs (springs, streams, vegetated areas, hilltops and steep slopes with no inhabitability). In the case of the Western Vector, the data collected and analyzed until now are preliminary and also demonstrate the heterogeneity of the spatial distribution of these public use free spaces.

This research, thus, seeks to contribute to the Architecture and Urbanism, with an emphasis on the relationship between free space systems and urban form. At the same time, it is inserted in the investigation demands of the public authorities and can be useful for application in the development of regional policies that lead to improving the population's quality of life.

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Editor's note

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