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Congonhas an example of connection between built and natural heritage in Minas Gerais, Brazil

Congonhas um exemplo de conexão entre o patrimônio edificado e o natural em Minas Gerais, Brasil

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Resumo: A utilização dos materiais pétreos pelo homem sempre foi influenciada, nem tanto pelos tipos, mas pela presença desses materiais, que compõem parte da geodiversidade do planeta e que são condicionados pelas ações de fatores relacionados às dinâmicas de subsuperfície e superfície. Ao longo do tempo, os humanos desenvolveram a capacidade de explorar esses materiais de acordo com suas necessidades, disponibilidades e facilidades de transporte e manufatura. A cidade de Congonhas, objeto desse estudo, pode ser considerada um bom exemplo dessa utilização da pedra na construção de seu patrimônio cultural com o uso de materiais da geodiversidade da região a sul do Quadrilátero Ferrífero e seu entorno. Assim, esses materiais foram amplamente utilizados na construção desse patrimônio e estão presentes em suas ruas, igrejas e outras construções, localizadas em seu centro histórico e arredores da cidade. Entretanto, é notório que grande parte desse patrimônio não foi preservada e o que restou está representado por algumas poucas construções civis e edificações religiosas. A partir do exposto, esse artigo pretende destacar a importância desse patrimônio remanescente e demonstrar possíveis conexões entre as pedras utilizadas nas diferentes formas do patrimônio cultural de Congonhas e o meio de onde foram extraídas (patrimônio natural). Diante desse cenário apresentado, conclui-se pela necessária adoção de estratégias que busquem e possibilitem não só a preservação desses bens, bem como uma ampliação do interesse turístico nessa região, onde os visitantes poderiam tomar conhecimento dessas conexões entre os patrimônios cultural e natural para a região de Congonhas.

Palavras-chave: Patrimônio cultural; Geodiversidade; Geologia; Conjuntos.

Abstract: *Throughout time, mankind has used stone materials in the production of various artifacts and in the construction of houses and monuments. These uses have always been influenced, not so much by the types of materials, but by their presence. Materials that are part of the planet's geodiversity and are conditioned by the actions of factors related to surface and subsurface dynamics. Over time, humans developed the ability to exploit these materials according to their needs, availability and ease of transport and manufacture. The city of Congonhas, object of this study, can be considered a good example of the use of stone in the construction of its cultural heritage. It used materials from the geodiversity of the southern region of the Iron Quadrangle and its surroundings. Therefore, these materials were widely used in the construction of this heritage and are present in its streets, churches and other buildings, located in its historic center and surroundings. However, it is clear that a large part of this heritage has not been preserved and a few civil constructions and religious buildings represent what remains. This article intended to highlight the importance of this remaining heritage and to demonstrate possible connections between the stones used in the different forms of Congonhas cultural heritage and the environment from which they were extracted (natural heritage). Given this scenario presented, it was concluded that it is necessary to adopt strategies that seek and enable not only the preservation of these assets, but also an expansion of the tourist interest in this region, where visitors could become aware of these connections between the cultural and natural heritage in Congonhas region.*

Keywords: *Cultural heritage; Geodiversity; Geology; Assemblage.*

1. Introduction

Congonhas city, located south of Belo Horizonte, capital of Minas Gerais state (**Figure 1**), is bordered by the towns of Conselheiro Lafaiete, São Brás do Suaçuí, Jeceaba, Belo Vale, Ouro Branco, Ouro Preto, and Itabirito, and it is also of historical importance to state and national territories. Its creation, in 1734 as Congonhas do Campo village, was due to gold occurrences in the region's rivers, found since the end of the 17th century. Initially, the population was organized on the right bank of Maranhão River, where its first churches and monuments were built, during the first quarter of the 18th century.

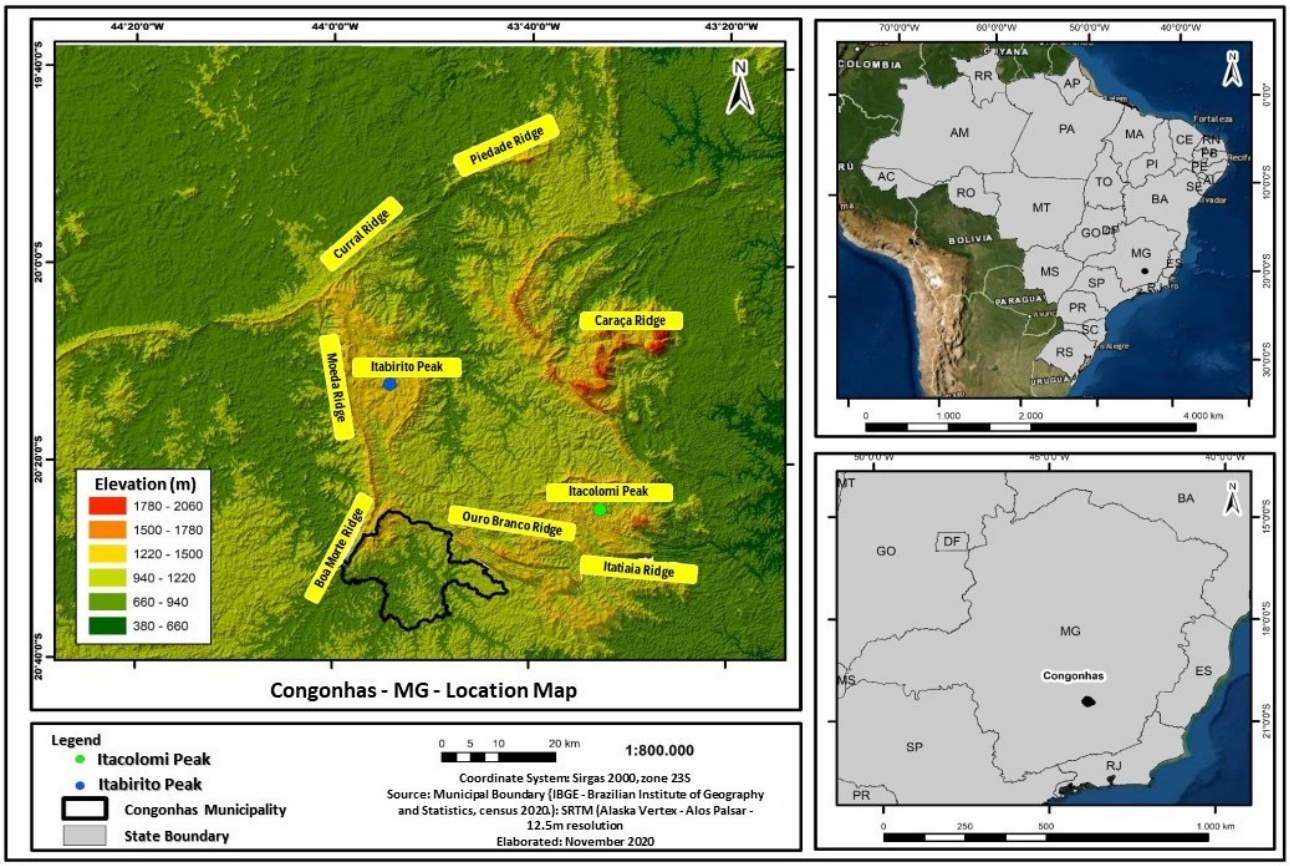

Figure 1: Iron Quadrangle with Congonhas city location to the south and the mountains ridges around it.

Congonhas is located at the confluence of routes opened and used during the 17th and 18th centuries in search of gold. Thus, these routes (COSTA, 2006), which involved other localities in Minas Gerais, such as Mariana, Ouro Preto (Vila Rica), Itaverava, Itatiaia, Ouro Branco, Lobo Leite and Conselheiro Lafaiete (Carijós, Queluz de Minas), ended up allowing an intense traffic of people and goods. Congonhas proved not to be very prosperous for the occurrence of this metal, since the existing deposits were quickly exhausted. Therefore, the city ended up playing a role much more of a warehouse, if compared to the other cities belonging to the Gold Cycle. Meanwhile, in the 20th century, Congonhas suffered a major impact with the discovery of large iron reserves in its territory. This fact brought growth and development to the region but had an opposite effect on its heritage preservation.

What remained of its cultural heritage from the 18th and 19th centuries is restricted to small nuclei, associated mainly with religious buildings, such as the Bom Jesus do Matosinhos Sanctuary, São José Church, Matriz de Nossa Senhora da Conceição Church, and the Rosário Church. The central and urban parts of the city present a great contrast between the rare historic buildings, and the modern ones, if compared to the legacy of the region's baroque still present in other nearby historic sites, such as Ouro Preto and Mariana. This part of the cultural heritage is represented by an axis that has its extremes delimited by the architectural complex of the Bom Jesus do Matosinhos Sanctuary and the Matriz de Nossa Senhora da Conceição Church. Both religious buildings from the 18th century located in the historic city center, which is also the main tourist attraction. Outside this axis, but on the outskirts of the city, relics from colonial times, such as the Nossa Senhora da Soledade chapel in the district of Lobo Leite and the Nossa Senhora da Ajuda church, located on Alto Maranhão district, are the most important buildings.

To build this heritage, stone materials such as granite, steatite (soapstone), serpentinite, and quartzite were used, as well as secondary materials such as pebbles and various types of sand, taken from rivers and streams in the region. All these materials are mostly part of ancient geological sequences outcropping to the south of the Iron Quadrangle. Other formations, with granites and some metaultramafics rocks, come from the surrounding belts, identified as Mineiro and Congonhas-Itaverava. Complementing the natural heritage of the region, the mountain ranges present in the surroundings of Congonhas must be mentioned. Altogether, these features can be considered sculptural that surround not only Congonhas, but several colonial towns in the central portion of Minas Gerais state. Additionally, they were refuges for indigenous populations and fundamental geographical barriers for the occupation of this region. These mountains are important elements of the landscape and natural heritage and are currently being partly compromised by the lack of an active and efficient conservation policy.

Based on these facts, this article aims to identify the provenance and describe the stone materials used in the buildings of the cultural heritage of the city of Congonhas do Campo and its surroundings in addition to presenting their relationships with the natural heritage. Furthermore, the paper also has the premise of drawing attention to the vulnerability of these assets, seeing that, in some cases, it is clear the advanced stage of degradation in which they are found.

2. Materials and methods

A research sequence involving some stages was established, in order to o achieve the objectives of this paper. These stages mainly focused on the survey, identification and clasification of the heritage present in Congonhas and its surroundings. The necessary steps for the development of this work are detailed below:

I- Bibliographical research: in this stage two distinct researches were carried out: one focused on the cultural heritage and the other on the natural heritage. For the cultural heritage extensive research was done in scientific articles, institutes, foundations, museums and university libraries, among them it should be mentioned the Institute of National Historic and Artistic Heritage (*Instituto do Patrimônio Histórico e Artístico Nacional* - IPHAN), the Municipal Foundation of Culture, Leisure and Tourism (*Fundação Municipal de Cultura, Lazer e Turismo* - FUMCULT), the Minas State Public Archive (*Arquivo Público Mineiro* - APM) and the library of the School of Fine Arts (escola de Belas Artes) of the UFMG. In electronic media, several articles were consulted and especially the United Nations Educational, Scientific, and Cultural Organization website (UNESCO). For the natural heritage, articles and cartographic bases referring to the region's geology were selected. There are countless authors who have worked on the Iron Quadrangle and several researches were carried out to make possible its stratigraphic understanding. The geology adopted in this research can be found in the Casa de Pedra and Congonhas's geological maps, both elaborated by the Economic Development Company of Minas Gerais (*Companhia de Desenvolvimento Econômico de Minas Gerais* - CODEMIG, 2005). From the identification of these units, it was possible to establish the connections between geology and the stone material present in the built heritage. In the line of natural heritage the work of Brilha (2016) served as the basis for this heritage classification, within the concept of geodiversity.

II- Fieldwork: this stage aimed at identifying and describing both the natural and the built heritage. Field trips were necessary to survey, identify and document the points of interest for the research, including the mountains and some soapstone outcrops and quarries around the urban center of Congonhas. In the phase that covered the survey of the built heritage, it was initially carried out the identification of the types of assets present, followed by a macroscopic description of their rock types, focusing on textural, structural and architectural aspects. From this description, it was possible to correlate the stone material to the southern portion of the Iron Quadrangle's geological units and its surroundings.

III- Heritage classification: this stage was focused on classifying the heritages identified in the field work. From this survey it was possible to separate the built heritage into three sets: devotional, road works/civil constructions and churches. This classification was based on its use, heritage relevance, and architectural design. The natural heritage was typified based on Brilha's proposal (2016) being possible to identify geosites, geodiversity elements and geodiversity sites from specific characteristics.

3. Theoretical framework

3.1. Geological heritage: concepts

Heritage preservation and conservation initiatives go back a long way, culminating with the creation of UNESCO in 1945. The “cultural heritage” term was only introduced in 1962, at the General Conference held in Paris. In this conference, besides the built heritage, there were references to archeological assets, landscapes and places of artistic interest (UNESCO, 1962), which was the first step towards the protection and conservation of natural heritage.

The "geological" adjective added to the concept of heritage is relatively recent, having been inaugurated in the international literature in the 1980s. But it was only since the 1990s that the term geological heritage began to be part of the works of several authors, such as Billet (1994), Salvan (1994), Ayala-Carcedo (2000) and Rivas *et al.* (2001). These authors, in an original and pioneering way, defined the elements present in certain areas, which are important or with significant contributions to the understanding about the geological evolution of a given region as geological heritage.

From the involvement of geology in these studies, the concept of geodiversity emerged. It was initially used in the 1990s by Sharples (1993), Dixon (1996) and Kiernan (1995), to describe the existing variations of abiotic nature. Along these lines, Gray (2004) included minerals, rocks, fossils, structures of various origins, sedimentary stratifications, landscapes, and active sedimentary and geomorphic processes, besides groundwater and soils derived from weathering of rocks. For Gray (2004) the strong correlation between the different types of geoheritage and the strong dependence of the geodiversity’s elements with the social, cultural and/or religious development of mankind, highlight their strong cultural value. Other values such as intrinsic, aesthetic, functional, economic, scientific and educational have also been associated.

The geodiversity and geological heritage’s management is done by the branch of geosciences called geoconservation. This term was first formulated by Sharples in the years 1995 and 2002, followed by Prosser (2002) and Gray (2004). It consists of the conservation of our planet’s natural characteristics and the preservation of the natural diversity of significant aspects and geological (substrates), geomorphological (landscape forms) and soil processes, maintaining the natural evolution (speed and intensity) of these processes (SHARPLES, 2002). According to Brilha (2005) geoconservation involves not only the legal protection of outstanding geological and geomorphological features in conservation units, but also the appreciation of geodiversity and heritage with the local communities, geoscientific education and geotourism, which brings external resources and moves the local economy. The whole set consists of the implementation of strategies that allow the conservation of geological occurrences of undeniable scientific, pedagogical, cultural and touristic value, characterized as geosites.

Brilha (2016) proposed a revision of this concept, which deals with the separation of geodiversity involving scientific or other values. In both situations he proposed identifications as *in situ* and *ex situ*. If the property has scientific value and is exposed in nature he proposed its identification as a geosite (in situ) and that this property is considered part of a geological heritage. On the other hand, if this good was removed from its original location but maintains its scientific importance, it should be identified as a geological heritage element, but in an *ex situ* condition, and it remains a geological heritage. Otherwise, when the property presents other values, which are not important from the scientific point of view, but for tourism, educational or even cultural identity reasons, they are considered geodiversity sites when *in situ* and geodiversity elements when *ex situ*.

3.2. Geological context of the Congonhas region

Considering the geological aspects, the region where Congonhas city is located presents a unique characteristic. Besides the presence of geological sequences that integrate the southern portion of the Iron Quadrangle (CODEMIG, 2005), other geotectonic compartimentations occur, which are part of the Mineiro and Congonhas-Itaverava belts. The rocks of these sequences represent the geodiversity of this region, in addition to mineral occurrences and relief forms.

In summary, the most significant geological units present in Congonhas’s region are represented by the Rio das Velhas Supergroup, which concentrates one of the most important occurrences of ultramafic rocks, with large deposits of talc, used in the manufacture of handcrafted works and monuments in the region; Cauê Formation, containing itabirite with high iron content, responsible for the mining activity; Moeda Formation represented mainly by quartzite disposed in the mountains that surround the city; metaultramafic rocks of the Congonhas-Itaverava Belt (SEIXAS, 1988) and by the granitic rocks of the Alto Maranhão Suite (Mineiro Belt).

These lithotypes variations are present in various monuments and buildings in the city, whether of greater or lesser heritage value. This fact clearly corroborates the interdependence between the cultural heritage of Congonhas and its geodiversity, since all the stone material used weres probably extracted from areas near the current city center, *i.e.*, from areas very close to the buildings. These materials applied generally represent the geodiversity elements of the region, present in buildings mainly focused on tourist, educational and religious interests.

4. Results and discussions

4.1. Geodiversity and cultural heritage in Congonhas

The Congonhas cultural heritage has a very strong connection with the geodiversity present in this part of Minas Gerais. The use of stone materials in the construction of its built heritage can be seen, but not measured, because little remains of these ancient applications. However, what can be observed, shows great value on various aspects, especially those aimed at the geological knowledge of the area, cultural, educational and tourism, here classified as elements of geodiversity (BRILHA, 2016).

In the city's surroundings there are several exhibitions of stone materials, partly with importance for the geological history of this part of Minas Gerais, which can be described as local geodiversity sites, due to the lack of scientific values (BRILHA, 2016). From some of these sites, and others with unknown locations due to the city's growth, materials were extracted and applied in the buildings of Congonhas and its surroundings. In these cases, these sites take on another importance, because they can be considered points from which materials can be obtained for the development of conservation and restoration actions.

In addition to the stone materials and their outcrops, the Moeda and Ouro Branco ridges, present in Congonhas' surroundings, are important configurations of the landscape, representing important geosites with scientific, educational, aesthetic, cultural and touristic relevance. These ridges were integral parts of the Iron Quadrangle Geopark's proposal (RUCHKYS *et al.*, 2012). Other features, equally important for the landscape, such as the Casa de Pedra ridge and its summit known as Morro do Engenho, are already partly impacted by mining expansion and present imminent risks of being totally suppressed by these activities, which are present in the region for at least 70 years. Due to this, and because it contains attributes focused mainly on educational and landscape values, this sculpture set was classified as a geodiversity site.

4.2. Built heritage survey

The cultural heritage elements of Congonhas, considered in this article, are inserted in the city's urban area and are listed by the IPHAN (1941). In the specific case of the Bom Jesus do Matosinhos Sanctuary, besides the federal and municipal registrations, it was recognized as World Heritage by UNESCO in 1985. The most relevant elements of this heritage are part of the circuit identified as Bom Jesus do Matosinhos Sanctuary - Nossa Senhora da Conceição Church. In this axis these elements were subdivided into three sets according to categories identified as follows (**Figure 2**): Devotional, Road Works and Civil Constructions, Religious Building.

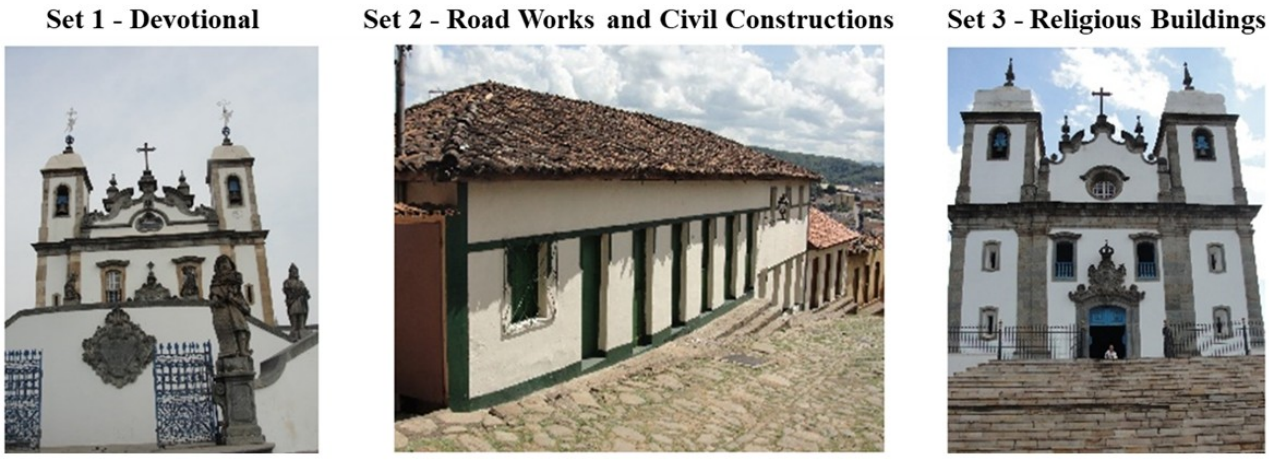

Figure 2: Cultural heritage classification in Congonhas, Minas Gerais.

Regarding the stone materials, it is worth mentioning that it was not always possible to recognize in the field the areas of provenance of the materials applied in this heritage, since no historical records were found, either about the purchase processes or about the extraction places.

According to Costa (2009), the stone materials used in the heritage buildings of the historic cities of Minas Gerais represent the local geodiversity, with outcrops and eventual quarries always located in the surroundings of old villages and, in some cases, in places very close to the buildings. Over time and with the growth of cities, the quarries ended up being totally destroyed and occupied by urban expansion. Generally, and for the most used types, it is known that the extracted soapstone, or steatite, belonged to the Rio das Velhas Supergroup, present in the southern Iron Quadrangle, while the granite used was from the Alto Maranhão Suite, which is a unit of the Mineiro Belt (CODEMIG, 2005). The stone materials used in the construction of the surveyed built heritage were identified as elements of the local geodiversity and transfer their geological memories to this heritage, according to Costa (2016).

4.2.1. Cultural heritage classification

Set 1, identified as Bom Jesus do Matosinhos Sanctuary is composed of the following elements: the church, the churchyard and its group of statues and the Passos chapels located around it. The sanctuary was built on top of Maranhão hill, currently identified as Basílica Square. Granite and steatite are widely used in the most varied forms of art. Granite is present in the external portion of the church. It was also used in the production of columns, pilasters, wedges, base, doorposts, lintels, and loopholes, while the soapstone (steatite) was used mainly in the production of ornaments and details of the facade, such as: cornices, oculus, cross, flowers, leaves, cartouche, and shield (**Figure 3**). It is worth mentioning that soapstone was the only rock used in the inside of the church, in portions around the main altar, columns, bases, sinks, parts of the pulpits, arch and parts of the floor present at the entrance of the church (**Figure 4**).

In the churchyard it can observe the presence of a sculptural set composed of twelve statues representing the prophets, access stairs, wall, cartouche and partial floor covering, all produced with the use of soapstone. What draws attention in this set is the great variation of shades presented by this rock, which varies from greenish to slightly blue tones, passing through grayish ones. As for other structural and textural elements, the rocks are sometimes massive and isotropic, sometimes with striking foliation. The heterogeneity observed for the types of soapstone used in the churchyard is indicative that these materials come from different extraction points or represent textural variations present at the site from which they were taken (Neves *et al.*, 2016). In the Passos chapels, steatite was used in the making of cartouches, balusters, internal and external floors, doorposts and lintels, cornices, columns and stairs.

Figure 3: Features of the Bom Jesus de Matosinhos Church's facade. The granite is present in the base columns and bell towers, while the soapstone occurs in the doorway (A), cornice, oculus, cross and ornaments (B). Note the yellowish color of the granite due to the presence of patina and dust (C) and the depredation with an inscription on the column (D).

Figure 4: In the internal portion of the church, soapstone was the only stone material used. It is present in the staircase and outline of the high altar, besides the columns (A), bases, sinks (B), pulpits (C), arch, eaves, oculus, windows, doors and part of the floor present at the entrance.

The buildings belonging to the historic urban center, streets and their respective paving, as well as walls and other structures, which still preserve elements that recall the characteristic architecture of the colonial period, are part of Set 2. The streets and their respective elements, such as curbs and paving were produced only in the late 19th century and early 20th century, granite being the main stone material used. The paving technique used is known as *pé de moleque* (**Figure 2**). As for the civil buildings, they already present important interventions carried out during the 20th century. However, it is still possible to identify traces that remind us of the 18th and 19th centuries architecture in some cases. In some of these buildings, constructed in stone masonry, it is possible to identify the presence of pebbles and gravel taken from alluvial deposits of the region's streams and rivers. Those built with the wattle and daub technique, on the other hand, use materials such as clay and sand also from the region's deposit.

Composing the preserved historical axis, the churches: Matriz de Nossa Senhora da Conceição and São José Church, built in the 18th and 19th centuries respectively, composes Set 3. The Matriz de Nossa Senhora da Conceição, if compared to the other churches, is the largest religious building in the municipality. It was built in masonry, with a plain facade and two front towers with a volute and a bell tower, connected to the church's body. Unlike the Bom Jesus church, only soapstone was used in this building, which is present in the columns, pilasters, wedges, bases, loopholes, doorways, cornices, doorposts, lintels, oculus, besides the ornaments on the facade and its interior. Inside, the snail-shaped staircase supported by a pilaster and the baptismal font in the shape of a shell, built and carved in soapstone, stand out. The São José church has its own characteristics, with rounded towers and neoclassical carved portals. However its external ornamentation is much simpler than the other churches in town, with little use of granite and steatite. The granite was used in the bell tower's lintels, in the tower's upper circular finish, and in the building's base. The steatite was used to produce ornaments for the front doorway, lintels and doorposts, cornices, cartouche, supports, and oculus. Internally, the steatite was used only for the floor covering, the production of the holy water font, and the staircase leading to the altar.

4.3. Natural heritage survey

The mountain ranges in the surroundings of Congonhas and other neighboring municipalities are the most important features, which present values with local and even national relevance. Besides playing an important role in understanding the local and regional geological evolution, these sites are fundamental to promote the tourist, landscape and educational aptitude of this region. In addition, these features had a great importance in the occupation of this portion of Minas Gerais, also as sources of stone materials needed in the construction of the cultural heritage. Some of the features already have strong impacts as a result of the expansion of mining and real estate activities, with imminent risks of being compromised by these activities.

In Congonhas and its surroundings, the features that stand out on these aspects are represented by the Moeda, Boa Morte, Ouro Branco (**Figure 1**) and Casa de Pedra (including the Hill of Engenho) ridges. Among these ridges, the Casa de Pedra is a topographic feature that designates the landscape composed by the hills of Engenho, Pilar and Santo Antônio (**Figure 5**). This set geologically encompasses the same sequence formed by quartzite, phyllite and iron formations, belonging to the Minas Supergroup that constitutes important local geodiversity sites. With regard to the impacts suffered, the Casa de Pedra ridge is the one that presents the greatest risk of losing its characteristics due to the increasing mining activities. At the moment, it is already disfigured from its original conformation and currently the expansion of these activities advances towards the Engenho hill.

From the Congonhas natural heritage point of view, the Casa de Pedra ridge composes a historical landscape very well identified with the other forms of the city's heritage. This identity is due to the fact that the ridge is facing the urban area of Congonhas, and includes the presence of the architectural Bom Jesus do Matosinhos Sanctuary complex (MPMG, 2000). Furthermore, this area is home to typical Atlantic Forest vegetation, with endemic amphibians and an abundance of vertebrates. There are also areas with ferruginous fields called *canga* and with this, a great speleological potential, due to the existence of natural cavities in the region. Reinforcing this importance for the ridges, studies conducted by the Public Prosecutor's Office of Minas Gerais in 2010, found that the Casa de Pedra ridge is configured as a spatial and environmental landmark, since it houses about 29 sources of public supply and is directly related to the cultural identity of the Congonhas residents.

Due to this importance, Law 2.694 was enacted on May 2, 2007, which "Disposes about the conservation of the landscapes of the Casa de Pedra ridge. Article 1 defines:

> The set of slopes facing the urban area, which make up the silhouette of the "Casa de Pedra ridge", as well as their intersections, springs and that ensure the municipality's public water supply, guaranteeing their preservation for the present and future generations, is hereby protected for preservation purposes.

Later, in 2012, municipal law 3,224 delimited the protected area of the Casa de Pedra ridge, to allow mineral research to be carried out on its perimeter, in violation of the 2007 law. On June 5, 2020, a Term of Environmental Commitment was signed between the Congonhas Secretary of Environment and the mining company, with the main purpose of stabilizing, recomposing and recovering the partially degraded area.

Regarding the other geomorphological features that surround Congonhas, the Boa Morte ridge configures a branch of the Moeda ridge with approximate E-W direction and is located in the Belo Vale municipality. Ruchkys (2007) emphasized the importance of this region as a geological interest area, called Geological Site of the Minas Supergroup, represented by Moeda ridge. Due to the presence of quartzite and banded iron formations, this region suffered many interventions in the past, either as a source of construction materials or for mining and real estate activities, an issue that continues until today.

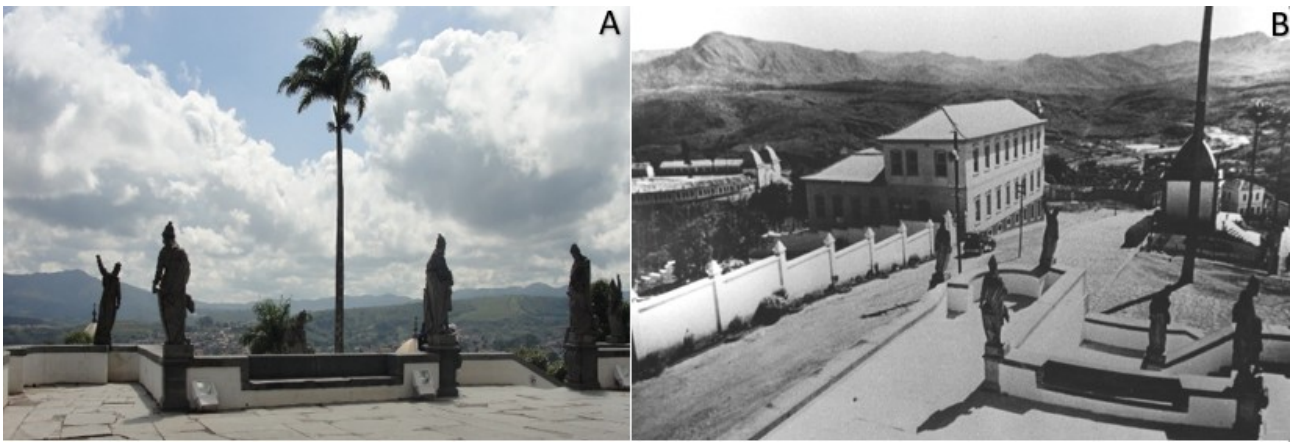

Figure 5: Photographs showing the Casa de Pedra ridges as a sculpture of the Bom Jesus do Matosinhos Sanctuary. Photograph (A) shows part of the set of hills already impacted by mining activity and photograph (B) a historical record with all this set preserved. Source: Photograph B - FUNCULT (1938).

Known in colonial times as "Serra do Deus te Livre", the Ouro Branco ridge, with great visual imponence and altitudes above 1500 m, is marked by diversity of relief forms and numerous rocky outcrops, waterfalls, caves and scarps, resulting from the action of tectonic and erosive processes, providing great tourist and environmental attraction in the region. In 2009, this area became the Ouro Branco ridge State Park, by means of Decree-Law 45.180 of September 21, 2009. Its northern boundary coincides with the boundary of the Itatiaia State Natural Monument and to the south with the Luis Carlos Jurovsky Tamssia Natural Heritage Private Reserve (established by IEF Ordinance No. 017 of 30/01/2008). In 2017, its management plan published 8 zones of use, one of which is the Historic-Cultural Zone, which comprises only 0.2% of its territorial extension. In this zone, archaeological, historical and cultural attributes were taken into consideration, described as extremely relevant and of fundamental importance to the identity of the people of Minas Gerais and Brazil. In the area, archaeological sites and ancient paths located inside the park were described, in addition to ruins (IEF, 2017). It is worth noting that the Ouro Branco ridge was selected by Ruchkys *et al.* (2012) as a geosite of regional interest from a scientific, educational, aesthetic, cultural, historical, and touristic point of view.

4.4. Evaluation of the current state of Congonhas heritage

The patrimony situated in the urban part of the municipality, grouped into 4 groups, and the surrounding ridges, are vulnerable to both anthropic and natural degradation risks. Some authors such as Kiernan (1995), Sharples (2002), Gray (2004, 2013) and Carcavilla *et al.* (2007) discuss concepts about sensitivity, vulnerability and fragility of geological heritage sites. A direct application of the concept of anthropic and natural vulnerability was used as a methodology in the preparation of the Spanish inventory of geological heritage sites in 2009, as a way of valuing the heritage. (GARCÍA-CORTÉS and CARCAVILLA, 2009).

In Brazil, the concept of vulnerability in built heritage is used by several researchers in the field of architecture, history and territorial management, including Zanirato (2010). In this approach it was observed that the built heritage of Congonhas is vulnerable to both natural and anthropic effects.

The built heritage represented mainly by the prophets, located in the external portion of the sanctuary presents great natural vulnerability. These statues were built with soapstone that due to the presence of talc and other phyllosilicates, presents low hardness. The effects of this vulnerability are mainly marked by chemical weathering at a geological time rate that are potentiated by environmental conditions. The anthropic vulnerability on this heritage has effects due to the public use, since they are points of easy visitation and with great circulation during the whole year. Even if the heritage is partly monitored by the municipality through security agents, its protection is not effective. It is impossible to control all the people present and, consequently, all the monuments, which also affects those located outside the Bom Jesus do Matosinhos Sanctuary circuit. **Figure 6** illustrates the types of anthropic and natural degradation to which this monument is exposed, in the case of the statues located in the Bom Jesus do Matosinhos churchyard.

On the other hand, the natural heritage shows a vulnerability mainly due to anthropic factors, since it is a region where economic interests are undoubtedly stronger than the conservation and cultural ones. One of the most impacted areas in this context is the Casa de Pedra ridge, which is currently uncharacterized from its original conformation (**Figure 5**). The importance of this feature is configured as a spatial landmark, directly related to the cultural identity of Congonhas' inhabitants, since this face of the ridge is integrated to the landscape of the sculptural complex of the Bom Jesus do Matosinhos Sanctuary (MPMG, 2000). However, all the ridges around Congonhas are generally neglected by the public authorities, since many of these areas are protected by law.

Figure 6: Photographs showing both anthropic and natural vulnerability of the statues symbolizing the prophets present in the Bom Jesus do Matosinhos churchyard. Advanced weathering processes, depredation with breaks in parts of the monument, graffiti, formation of biological accumulations, patina, black crusts, and impurity deposits are noted. The last photo dates from the end of the 19th century, where part of the arm was broken probably due to explosives.

5. Conclusions

The geodiversity elements, especially the rocks of the region, were fundamental in building the heritage present in Congonhas. This gives a very particular identity to the set, which in this case keeps both the historical memory of a remarkable time, represented by Colonial Brazil, and also keeps a record of its geological memories.

This connection is signaled by the presence of stone materials in the construction of its monuments and by the surrounding ridges. The rocks used are represented particularly by steatite (soapstone) and granite, which are still found today in the outskirts of the city and in the boundary areas between the southern part of the Iron Quadrangle and the Mineiro Belt.

In the city of Congonhas there is still a heritage ensemble, which can be observed in the axis that runs from the Bom Jesus do Matosinhos Sanctuary, declared a humanity heritage by UNESCO in 1985, to the Nossa Senhora da Conceição Church. This circuit is represented inside the Congonhas Museum, which was conceived as the first "*site museum*" in the country and offers historical and contextual information, especially for those visiting the Bom Jesus do Matosinhos Sanctuary. Besides the sanctuary, which is still considered today as the important element for visitation, Congonhas' heritage ensemble has much more to show. Among others exhibited in the world, it is also an important example where the use of stone occurred with the direct application of elements from its geodiversity. It is noteworthy that some of the elements of this set are already very much compromised by mining enterprises and real estate expansion present in the city.

In the natural heritage part, the sites where these stone materials were outcropping, either in the surroundings or in the central part of the current city's urban center, were almost completely destroyed because of the population increase and consequent urbanization. On the other hand, the mountain ranges that are part of the local geodiversity, also present a certain vulnerability, and because of the growing mining activities present increasingly perceived changes.

Despite the importance of its built elements, partly recognized as humanity heritage, and the possibilities represented by the surrounding natural heritage, the city of Congonhas is still positioned as a place of passage for visitors interested in the historical past of Minas Gerais. In this context, and seeking possibilities that contribute to increase the interest and permanence of tourists in the city, it is understood that the connection between the source areas of the stone materials (natural heritage) and their applications in the built heritage could be better explored. A detailed work on this connection and its clear presentation could contribute to an expansion of options for visitors, making them interested in a circuit that integrates the built heritage with the hills and quarries in the region.

As points of interest to be part of an integrated route can be indicated the Ouro Branco, Boa Morte ridge, as well as some quarries located in the Alto Maranhão district. These geosites and geodiversity elements represent not only source areas that visitors could access, but also important landscape elements with multiple values.

An example that makes up the natural heritage and also a geodiversity site is the Casa de Pedra ridge, which can be observed from the Bom Jesus do Matosinhos Sanctuary. From this observation point, and as a starting point for an itinerary, visitors could develop interest in these connections involving the natural and built heritage present in Congonhas.

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