

The perception of geotourism by Park managers

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Abstract

The search for resources generates human pressure on natural areas, which are essential for the balance of the geo-ecosystem. Such as parks which, from the categories of nature protected areas, are the most sought after by tourists, as the Parque Nacional da Serra do Cipó, the Parque Estadual do Itacolomi, and the Parque Estadual da Serra do Rola-Moça, in Minas Gerais - Brazil and their main ecogeo-tourism attractions, waterfalls, scenic viewpoints and peak respectively. In turn, this pressure reflects on the importance of the management of nature protected areas for both conservation and tourist access. Thus, the aim of the present work was to identify the perception of geotourism by the managers of three parks in Minas Gerais. For this, the methodological procedures considered were literature review, elaboration of a data collection instrument, interviews with the park managers, tabulation, analysis of the data discourse and discussion. Managers know geotourism, but they conceptualize it without the interpretative aspect; the parks have geological attractions, partly motivating visitors; the geological heritage is related to the landscape, and it is important to preserve it. The association between geotourism and ecotourism, already present in the parks, was also observed, as a strategy for the conservation of geodiversity and biodiversity. We expect that this research serves to the review of the management plans and to the management itself of the parks, enabling geoconservation strategies.

INTRODUCTION

The creation of protected areas has been occurring with a functional bias, since the first botanical gardens for leisure and healing purposes up to the parks, depriving traditional populations in exchange for scenic conservation. The protection of this scenic beauty can guarantee the conservation of biodiversity from part of the landscapes, contributing to the cultural heritage (VIEIRA; VERDUM, 2019). Also fulfilling one of the objectives of nature protected areas (NPAs): to protect natural and little altered landscapes of remarkable scenic beauty, due to its natural and cultural attributes - the park and natural monument categories, for instance (BRASIL, 2000).

For the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2001) “Geoparks are unique and unified geographical areas, where places and landscapes of international significance are managed with a holistic concept of protection, education and sustainable development.” In this line, Onary-Alves et al. (2015, p. 104) state that geoparks “are part of an initiative for conservation and scientific, social and educational development of a region with a natural scenic appeal”. However, the management of these areas is a challenge for all spheres of society. If, on the one hand, the responsibility for their creation lies with the public authorities, on the other the use by the public is also the responsibility of the private sector and of the civil society.

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Thus, in this shared governance, the volume of information that managers have to deal with (e.g. management plans, programs to combat forest fires, scientific research projects, permits for paving and mineral exploitation, among others), added to the administrative routine (e.g. visitor control) is a threat, but also an opportunity.

One example is geotourism. Notably, research in this interdisciplinary area of knowledge (Earth Sciences and Applied Social Sciences) has been increasing, and NPAs - especially parks and natural monuments - have been objects of study, valuing the “unknown” geodiversity. Although present in most of the conventional Brazilian attractions (MANTESSO-NETO et al., 2012), as a geotourism attraction, complementary to the “known” biodiversity, in turn as an ecotourism attraction. As for geodiversity, for Gray (2004) it is the “variety of environments, phenomena and active processes of geological character, generators of landscapes, rocks, minerals, fossils, soils and other superficial deposits that constitute the basis for life on Earth”.

Most of these geotourism studies focus on the inventory and valuation of the offer of those designated as “Geosites”, followed (not necessarily in this order) by management of geoparks (MEDEIROS; GOMES; NASCIMENTO, 2015), geotourism demand, epistemology of geotourism (BENTO; FARIAS; NASCIMENTO, 2020; PEREIRA, 2017). Regarding the Quadrilátero Ferrífero, about one quarter of the surveys in the region are related to geotourism, demonstrating the importance of studies related to its management in NPAs.

In this sense, we sought to identify the perception of geotourism by the managers of three parks in Minas Gerais (MG), located in important geological areas of Brazil, namely: Parque Estadual do Itacolomi (PEIT), Parque Estadual da Serra do Rola-Moça (PESRM) and Parque Nacional da Serra do Cipó (PNSC).

Theoretical Reference

The Federal Constitution (BRASIL, 1988) highlights, in Article 225, the co-responsibility in managing the environment: “everyone has the right to an ecologically balanced environment, an asset of common use by the people and essential to a healthy quality of life, being imposed on the Federal Government and on the public itself the duty to defend and preserve it for present and future generations”. In the case of NPAs, it is ratified by Art. 2 of the Law of the National System of Nature Protected Areas - SNUC (in Portuguese, Sistema Nacional

de Unidades de Conservação) (BRASIL, 2000) which considers them as:

territorial space and its environmental resources, including jurisdictional waters, with relevant natural characteristics, legally instituted by the Government, with conservation objectives and defined limits, under a special administration regime, to which adequate protection guarantees apply.

However, what has been observed are several hindrances, especially related to participatory management: land issues, lack of human resources, forest fires, etc. (MMA, 2004). Regarding the park category, Art. 11 of the SNUC clarifies its basic objective:

the preservation of natural ecosystems of great ecological relevance and scenic beauty, enabling scientific research and the development of activities of environmental education and interpretation, of recreation in contact with nature and ecological tourism (BRASIL, 2000).

The management of NPAs has been the subject of several studies (CARRERAS; DRUGUET, 1999; EAGLES; MCCOOL; HAYNES, 2002; CROFTS; GORDON, 2015; MEDEIROS; GOMES; NASCIMENTO, 2015; PELIZZARO et al., 2015). Not limited only to the administration area, as it involves various aspects, such as the three main fronts, according to the management plan methodology: abiotic, biotic and socioeconomic resources. However, at the very beginning of the protection of natural areas, from the botanical gardens in China, to the Yellowstone Park model in the United States of America, there has been a “biocentric orientation” (MEIRA; NASCIMENTO; SILVA, 2018).

Despite the Letter of Digne, France, which, just before Rio-92, established the rights to the Memory of the Earth. According to Munhoz and Lobo (2018, p. 28) “a large part of the elements of geodiversity are supported by the Brazilian legislation”, but there is no specific law, which may generate differences in interpretation and, consequently, in geoconservation. For Sharples (2002) geoconservation seeks to preserve the natural diversity of the substrate (geological processes), shapes (geomorphological processes) and soil (pedological processes), via their natural processes.

Perception, in turn, involves characteristics such as information, knowledge, social representation, among others. In other words,

the relationship between the human being and the environment, bringing to light the "environmental perception", that is, "nature is what we observe through the perception obtained through the senses" (WHITEHEAD, 1920, p. 5).

In this sense, management effectiveness studies have been carried out in state and federal NPAs in MG (LIMA; RIBEIRO; GONÇALVES, 2005; REZENDE et al., 2010; SANTOS, 2016) and Brazil (WWF, 2017), with the intent of assuring that NPAs do not exist "only on paper", guaranteeing their existence beyond their creative act, as a space managed and enjoyed by the community and preserving their natural and cultural heritage, such as ecotourism.

Although there is no consensus that geotourism is a tourist segment (COUTINHO et al., 2019; MOREIRA, 2010), the present work considers it to be in development, which will be possible from the definition of its offer, demand, geographical space and distribution. Although its roots go back to the fieldwork of Physical Geography in the 17th century (HOSE, 2016) or Geology in the 19th century (MACFARLANE, 2005 apud MOREIRA, 2010, p. 6), the first time the term was conceptualized was in Hose (1995, p. 17) as the "provision of services and interpretative facilities in order to enable tourists the understanding and acquisition of knowledge of a geological and geomorphological site instead of simple aesthetic appreciation". This definition diverges from the Eastern point of view, as Chen, Lu and Ng (2015, p. xiii) claim that geotourism is known in China as "Earth Science Tourism": "Chinese geologists have adopted geoscientific methods in exploring tourist opportunities provided by geology and the natural landscape". This does not differ much from the Western view, both approaching the principles of ecotourism.

Also, there is no consensus for the term ecotourism, although Buckley (2003, p. 76) clarifies its connection with geotourism:

Ecotourism can hence be viewed as geotourism with a positive triple bottom line. There are several advantages to this approach. (1) It clarifies the meaning of ecotourism without redefining it. (2) It bypasses the service components which are common to tourism in general, not distinctive to ecotourism. (3) It treats environmental management and interpretation as means, not ends. (4) It requires an accurate accounting of environmental and social, as well as financial, costs as well as benefits. (5) It

differentiates ecotourism from tourism products with a mere veneer of green. (6) The tourism products and organisations which are generally viewed as the world's best practice in ecotourism do comply with this definition.

The management of ecotourism has long been approached by researchers, unlike the management of geotourism, which is often associated with that of geoparks (FARSANI; COELHO; COSTA, 2010; MEDEIROS et al., 2015), disassociated from the management in NPAs (MEIRA; NASCIMENTO; SILVA, 2018).

Description of the Study Areas

Created in 1984, the PNSC (Figure 1) covers approximately 31,000 ha. It is located in the municipalities of Jaboticatubas, Santana do Riacho, Morro do Pilar and Itambé do Mato Dentro (MG) and it is managed by the Instituto Chico Mendes de Conservação da Biodiversidade - ICMBIO (2009), responsible for the management of federal NPAs. Its main attractions are waterfalls and trails, formed mostly by the Serra do Espinhaço (Figure 2A).

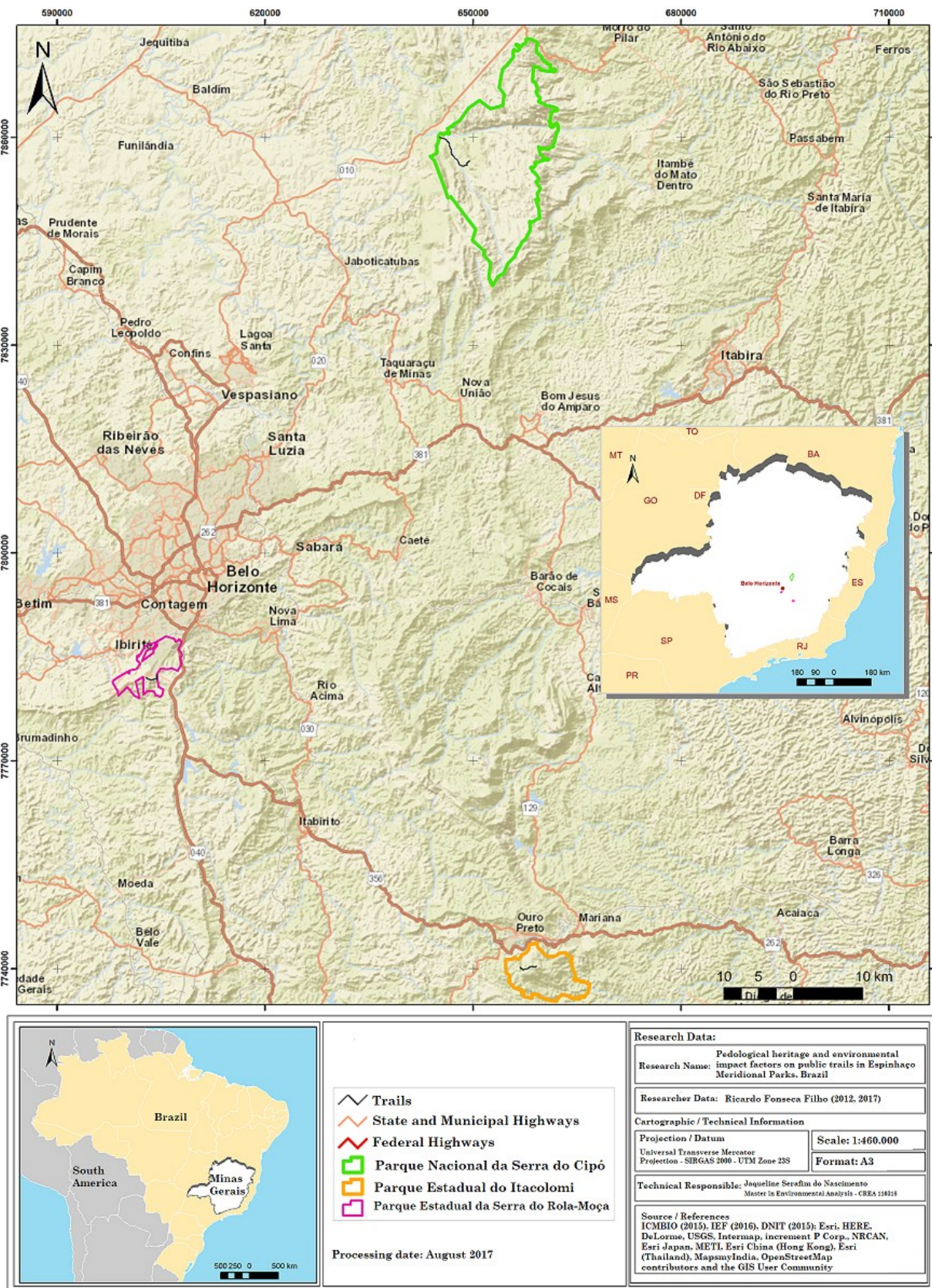
The PESRM, created in 1994, has 3,942 ha and is located in the municipalities of Belo Horizonte, Brumadinho, Ibirité and Nova Lima - MG, Brazil (Figure 1). It is managed by the Instituto Estadual de Florestas - IEF (2007b) and Companhia de Saneamento de Minas Gerais. They are responsible for protecting forests and sanitation on that part of the State, respectively. Its main attractions are the scenic viewpoints, especially the Morro dos Veados, braced by the iron ore deposits from the Serra da Moeda (Figure 2B).

PEIT was created in 1967. It has 7,543 ha and is located in the municipalities of Ouro Preto and Mariana (Figure 1), being managed by the IEF (2007a). Its main attraction is Pico do Itacolomi, the highest point in the municipality of Mariana, with 1,772 meters of altitude (Figure 2C).

Due to their physiography, the parks have a rich biodiversity (DRUMMOND et al., 2005) and geodiversity (MACHADO; SILVA, 2010), constituted, mostly, by Atlantic Forest and Cerrado vegetation, with species endemic to the quartzite rupestrian (PEIT and PNSC) and ferruginous (PESRM) fields; rich hydrography from the São Francisco River Basins (PESRM and PNSC) and Rio Doce (PEIT in both); geomorphology with predominantly mountainous relief (PEIT), with valleys (PNSC) and plateaus (PESRM); young, mineral and

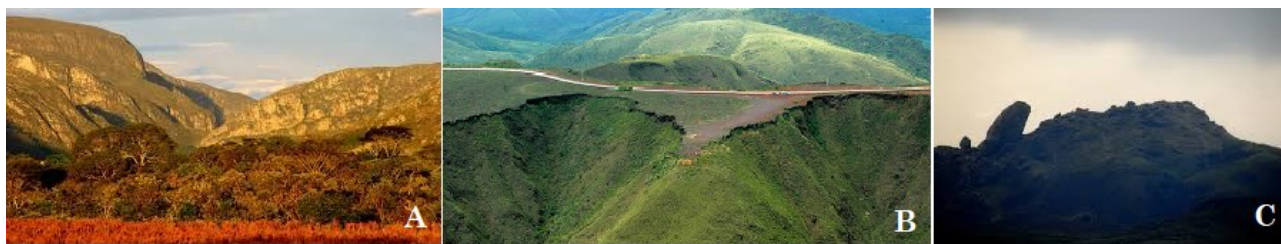
poorly developed soils in the three parks (IEF, 2007a, 2007b; ICMBIO, 2009).

Figure 1 – Map of location and access of Parque Nacional da Serra do Cipó, Parque Estadual da Serra do Rola-Moça e Parque Estadual do Itacolomi, Brazil.



Source: author (2017).

Figure 2 – A – Serra do Cipó. B - Serra do Rola-Moça. C - Pico do Itacolomi.



Source: A. B. Edward Elias Junior (no date, 2014); C. Evandro Rodney (no date).

As for geology, they are part of an important Brazilian compartment: the Quadrilátero Ferrífero and Serra do Espinhaço. In general, PEIT and PNSC are formed by quartzite rocks from the Proterozoic period, groups Sabará and Macaúbas respectively. As for PESRM, the Itabira Group stands out, with iron formations, including iron ore deposits (BRITO, 2017). The system of folds and faults to which the park region has been conditioned throughout geological history has influenced, on the one hand, the economic bias, with the presence of mineral reserves, and on the other, the environmental bias, with landscapes and species of unique biodiversity and geodiversity. According to ICMBIO (2009):

no attribute characterizes Serra do Cipó better than its diversity. Starting with its geology, whose history goes back 1,700 million years, with a wide variety of limestone, quartzite, granite and soil varieties. All this geological variety originated from the deposition of marine material that, over time, was sedimented at the bottom of an ocean. The rugged terrain offers so many paths to the streams that spring from everywhere, culminating in climatic differences between the east and west sides. This entire base made available to evolution culminated in one of the most diverse floras on the planet, with an extremely high degree of endemism, one of the largest in the world, and with more than 1,700 species already recorded.

Addressing the geodiversity in PEIT, Ostanello, Dandefor and Castro (2013, p. 287) state that “among the components of the local geodiversity are ruiniform outcrops, well-preserved structural features, caves, waterfalls, crevices, in addition to an exuberant landscape.” According to Reis (2017, p. 132) PESRM has “high geodiversity belonging to the features of mountainous domains and escarpments, which are associated with the great presence of classes of variables of altitude and soils”, especially due to mineral occurrences (PEREIRA; AZEVEDO;

ONDICOL, 2013), such as the ferruginous rock fields.

As for services, they count on environmental monitors, fire brigades, scientific research, environmental education projects - with schools in the communities in which they operate -, advisory councils, among others.

METHODOLOGY

The first phase of the research was a bibliographic review on the study areas (parks' management plans) and related themes (geotourism, management effectiveness and content analysis). Then, a data collection instrument of the qualitative structured script type was elaborated, according to the survey methodology (BABBIE, 2003).

The qualitative/quantitative structured script, composed of nine questions, sought to comprehend two categories: visitor and geoconservation - geology and soils. The variables used are similar to the interview scripts for geotourists at PEIT (FONSECA FILHO; MOREIRA, 2017), PESRM (FONSECA FILHO; RIBEIRO, 2016) and PNSC (FONSECA FILHO et al., 2018), and are important due to the relationship with geotourism management. The sample consisted of the NPA managers, with two audio-recorded interviews in person. All interviewees authorized the recording of their interviews and the use of the data through the Informed Consent Form.

In sequence, a home-type interview was scheduled with the three managers, taking place between the end of 2016 and the beginning of 2017: two in person at the Visitors Center (one at PEIT and one at PESRM); and a remote one via Google Forms to the head of the PNSC.

After tabulation of the data, they were subjected to content analysis, which, according to a survey of Sousa, Rodrigues and Tomazzoni (2016), is relevant in the field of tourism. According to Bardin (1999, p. 44), content analysis is

a set of techniques for analyzing communications in order to obtain systematic and objective procedures for describing the content of indicator messages (quantitative or not) that allow the inference of knowledge related to the conditions of production/reception (inferred variables) of these messages.

RESULTS AND DISCUSSION

The code and linguistic support of the interviews was basically oral (two interviewees), and just one interviewee written.

The visitor category, that is, who the user of the parks is, brings data from the point of view of the managers (Chart 1), such as: the majority are from the community and excursionists (PEIT and PESRM); they travel with families, have access to information via the internet (social networks) and “word of mouth”; and they are motivated by ecotourism (landscape) and adventure tourism (hiking and cycling on trails). Data that ratify surveys from the Observatório de Turismo de Minas Gerais (2017) regarding Ouro Preto, Brumadinho and Santana do Riacho, municipalities where the main areas visited in the parks are located.

As for the speeches of the managers about the attractions visited, there is a connotation to geotourism, as it involves cultural and natural values:

he [the visitor] goes to Pico or Lagoa, he will stop here, pass by the visitor center (...). So, of course, it is the most visited of all, because he will stop here, he will make his "tour" here in the historic center and then he will leave for his final destination. (MANAGER PEIT, 2017)

Now what we have is the scenic viewpoint of Morro dos Veados, which is the best known, the most visited, it really has a great visitation status. (MANAGER PESRM, 2016)

Although there was no response from the PNSC manager, the List of Attractions from the park (ICMBIO, 2020) demonstrates that water attractions (especially Cachoeira da Farofa and Cânion das Bandeirinhas), are the main ones. Managers also have a similar perception of the motivation of visitors regarding attractions and geo-ecotourism:

It is Pico do Itacolomi, no doubt, it is the main attraction. (MANAGER PEIT, 2017)

The landscape (...) the scenic viewpoints. (MANAGER PESRM, 2016)

Knowing the waterfalls in the Park. (MANAGER PNSC, 2017)

In turn, as for the trails in NPA and geoparks, they are the main means of reaching the attractions. According to responses from the interviewees (Chart 1), their characteristics in the parks are predominantly positive, with emphasis on the need to create geointerpretative trails.

Chart 1. Content analysis of interviews with Park managers.

Category	Subcategory	Registration unit	Context unit
Visitor	Visitor Information	Tripadvisor, Facebook, Parks of Minas and “word of mouth” (PEIT)	<i>The current picture: I think Facebook (...), the park, it is indicated on Tripadvisor (...) But I think it's the main one, and word of mouth (PEIT)</i>
		Television, social networks and "word of mouth" (PESRM)	<i>Their own television media, for the programs they link, which reach a very large audience, right [sic] and then social networks and word of mouth (PESRM)</i>
		Internet, TV and newspaper reports (PNSC)	<i>Internet and media reports (TV, newspapers) (PNSC)</i>
Geoconservation	Availability of geology knowledge by visitors	No (PEIT)	<i>If he [the visitor] has to go to the visitor center, and in the part where there was an interpretative sign for this purpose, he will have this information. Maybe to [sic] those who are not from the area, who have no knowledge, it is a little difficult to understand (PEIT)</i>
		Partly (PESRM)	<i>Yeah ... Well (...) we would like him [the visitor] to know more (PESRM)</i>
		No (PNSC)	<i>No (PNSC)</i>
	Yes (PEIT)	<i>Of course, certainly (PEIT)</i>	

Contribution of geology knowledge to the landscape	Yes (PESRM)	<i>Sure, sure, Serra do Rola-Moça, Serra da Calçada, Serra da Moeda, Serra do Curral, these are references that the visitor has.</i>
	Yes (PNSC)	<i>Yes (PNSC)</i>
Geological Heritage Definition	Landscape framework involving protected area (PEIT)	<i>It is all this framework of the landscape that is surrounding the protected area, from which it is part (...) the one the visitor will be able to see, will be able to touch and interact with (...) which lacks preservation, because there is a fragility there (PEIT)</i>
	Relief (PESRM)	<i>Actually, the landscape in general is associated with geology (PESRM)</i>
	Geological formations, soils, rocks, fossils, voids (PNSC)	<i>The set of geological formations, evidence of these formations, diversity of soils and rocks, fossils, caves (PNSC)</i>
Importance of geological heritage protection	Visitors and geosystem (PEIT)	<i>There are two biases: first because of the landscape and cultural importance of the visitor himself, to ensure this for future generations, and second for the preservation of geosystemic processes as a whole (PEIT)</i>
	Preserving the landscape (PESRM)	<i>It is greatly important, it is essential for the existence of the park itself, for protection even because of the mining activity (PESRM)</i>
	Environmental protection, scientific knowledge (research), Environmental Education (EE), employment and income (tourism) (PNSC)	<i>It is part of protecting the environment; it provides knowledge and environmental education; in the perspective of tourism, it is a factor that generates employment and income; important for scientific research and development (PNSC)</i>
Landscape modification motive	Erosion and silting up (PEIT)	<i>I think the guy is not interested when he sees the environment devastated like that. Or a well from a waterfall like this... (PEIT)</i>
	Mischaracterize the relief (PESRM)	<i>Because of the use (...), its use, mining will de-characterize, it will change the terrain, the geology of the region (PESRM)</i>
	Flora, fauna, landscape features (PNSC)	<i>There are direct reflections of this degradation on the flora, consequently on the fauna; the base of the landscape and its features are based on the soil and rock formations, their degradation directly modifies the landscape features (PNSC)</i>
Attractive geological examples Park	Itacolomi Peak (PEIT)	<i>I think I will not even be able to answer this question (...), because I have been here for a year and a half, because I focus more on management, I hardly knew Itacolomi. It is ... many areas are difficult to access (...). I've been to the peak, obviously, I flew over, but I don't know, there's still a lot of places I want to visit, which will surprise me, I think (...) (PEIT)</i>
	Summits (Morro dos Veados, Planetas, Jatobá), voids, iron ore deposits (PESRM)	<i>Ah [sic]! More than one! It is the landscape itself, the caves, the caverns, the scenic viewpoints ... I think one thing that is well related to this is the iron ore deposits. The iron ore deposit is something that characterizes the region a lot. It is even very used. The visitor center itself, that is the administrative headquarters, it explores this thing of the landscape, of the relief, even to have harmony (PESRM)</i>
	Mountain Range (do Cipó), Canyon (das Bandeirinhas), Rock formations (quartzite) (PNSC)	<i>Mountain formations, Travessão, Bandeirinhas Canyon, rock formations (in quartzite) (PNSC)</i>

	Geopark Definition	Territories of geological interest for conservation and dissemination (PEIT)	<i>They are territories of geological interest, for preservation, conservation and dissemination (...) it is a program, with the recognition from UNESCO (...) it is the same of Biosphere Reserve (PEIT)</i>
		Territorial space associated to relief and geology (PESRM)	<i>A territorial space, that is associated to relief and geology, like the Quadrilátero Ferrífero (...) involves different biomes, yes ... but it is in a geological formation that ... in your conception you can have ... targeting of the management (PESRM)</i>
		Did not answer (PNSC)	<i>Did not answer (PNSC)</i>
	Geopark benefits for visitors	Partly (PEIT)	<i>It is feasible with limitations (...) if there are instruments, programs (...) mainly participatory management (PEIT)</i>
		Experience, protection (PESRM)	<i>Today we have a focus or targeting people in ... unique moments, places (...). So, from the moment, it is like you are a collector, that is the satisfaction of being enjoying an area that ... it is recognized as a geopark (PESRM)</i>
		Environmental education, employment and income, community participation (PNSC)	<i>By associating visitation with an environmental education strategy, visitors can become allies of the cause of visitation; with the generation of jobs and income associated with tourism, which can benefit local communities; justifying the greater use of resources in conservation (PNSC)</i>

Organization: author (2020).

Eisenlohr et al. (2013) pointed out that trails have an ecological role in maintaining ecosystems, including in geodiversity, in addition to biodiversity. That is why these trails are also the object of study of the management of the sampled parks, this is evident in their management plans, geotourism itineraries proposed (FONSECA FILHO; CASTRO; VARAJÃO, 2019; OSTANELLO; DANDERFER; CASTRO, 2013) and statements from managers, who consider important improving them - as the trails suffer impact from erosion and littering - especially as access points to attractions. This theme is recurrent in geotourism and ecotourism research in parks.

Regarding the geoconservation, due to the amount of data, it was decided to focus on the attractions visited and on which of them are considered geological, in the definition of geotourism and in the point of view of the geoparks.

As for geotourism, the interviewees know what it is or have heard about it, however, definitions of the concept given by the managers vary. While for PEIT and PNSC managers it includes principles of geotourism, such as the interpretation of geodiversity, for PESRM it also brings aspects of ecotourism:

the person having the opportunity to interpret the landscape where they are inserted, it is also to have the opportunity to

decode the history not only of the place, but of the very life of the Earth, which is carved on those rocks, printed on that landscape, it is the opportunity to learn from Geology, which is a science about natural processes and how we, the humanity, can interfere in these processes. (MANAGER PEIT, 2017)
the geotourism is associated to this landscape (...) a new concept of you associating it to the relief (...) to the biodiversity, to the phytophysionomy of the region, if whether it is the Atlantic Forest (...) (MANAGER PESRM, 2016)
Tourism modality that has as reference the visitation focused on geological heritage, seeking to know and disseminate aspects of geological/geomorphological formation. (MANAGER PNSC, 2017)

This observation by the PNSC manager - regarding the geological heritage and the knowledge about it - is corroborated by Newsome, Dowling and Leung (2012) who analyzed two geotourism destinations in Taiwan and Australia and found that, even with the management of Geosites and geoparks, negative impacts are difficult to contain, which especially justifies protection. What does not differ from ecotourism, as pointed out and by Buckley, Pickering and Weaver (2003) and by the speech from the PEIT and PESRM managers, when realizing that conservation through geotourism

can be given by (environmental) education, as in ecotourism:

*Based on the assumption that we can educate people. (MANAGER PEIT, 2017)
 (...) one more option for visitation (...) associated to environmental education. (MANAGER PNSC, 2017)*

As for the geological heritage, managers raised characteristics related to it. However, only the PEIT manager pointed out two essential ones: protection and fragility. According to Brilha (2005) they are unique elements of geodiversity that are important for understanding the evolution of planet Earth and this heritage must be protected. This is also confirmed by Carreras and Druguet (1999) regarding the relationship with cultural heritage, for example, knowledge and practices of mining and construction.

Asked if heritage (geological) can assist in the conservation of NPAs, managers focus on functional (PEIT), aesthetic (PESRM) and educational (PNSC) values. In the latter, Brito (2017, p. 30) found that there is geoconservation in the PNSC Management Plan, "although, in practice, an action that constitutes an effective management proposal in this aspect has not been identified", including actions of environmental education, but they are not continuous. A state research by Alves et al. (2011, p. 355) with 74 state NPAs in MG - 26 of which are parks, including PEIT and PESRM - characterized that it is "evident, therefore, that the advances that the IEF has been achieving in various aspects related to the management of natural resources from Minas Gerais should be extended to NPA managers more effectively." As for the training of managers of NPAs in MG, the authors (ALVES et al., 2011) call attention to Biologists, what coincides with the scholar background of the three park managers in the present research.

In a national study, at Parque do Bicão, in São Carlos, São Paulo, Toyama et al. (2018) recognized the importance of the urban park for geoconservation through the survey of its geological information. As it is stated by Reis (2017, p. 133) "the PESRM is an important conservation unit of the Quadrilátero Ferrífero and its planning and management must consider actions that value its geodiversity through environmental education, as is the case with geotourism."

International studies, as the one from Crofts and Gordon (2015) have already observed that geoconservation in protected areas is necessary due to threats and pressures such as

urbanization, mining, climate change and even geotourism. In turn, Gordon et al. (2018) confirm this by identifying six key areas that offer opportunities to improve geoconservation, among them the management of protected areas, which is in line with this research.

Regarding the perception of the geopark, misunderstood by a considerable part of the (geo) tourists in them as if they were "geological parks" and the Quadrilátero Ferrífero were an "iron ore mining", the managers, however, know that the PEIT and PESRM parks are included in the area of the Quadrilátero Ferrífero and the PNSC is nearby. Considering that most scientific research in NPAs is related to biodiversity (especially flora), Swierkosz et al. (2017) observed the relationship between geoconservation and education in geosciences in the conservation of the biodiversity in a Geopark in Poland, which points to this integrative approach, both by park managers and management institutions (IEF and ICMBIO).

Reynard and Brilha (2018) bring some examples of management of geological heritage, as in Tasmania (Australia) and at the Florissant Fossil Beds National Monument (USA), highlighting the importance of a protection movement from local communities, and not only from public organs. This appears in this research regarding management (good) and participation of the community (reasonable).

There is a certain infrastructure (e.g. visitor center and trails) and services (e.g. monitors and research) for geoconservation in the parks. Ferreira, Lima and Candeiro (2020, p. 598), in a study in Paraúna, Goiás - Brazil, relates the structure and visitation to conservation, bringing subsidies for managers of protected areas or not:

Each Geodiversity site has its own specificity with different natural elements such as waterfalls, hills, stone walls and caves. Because they are tourist spots, these areas are visited periodically, however, some locations lack adequate infrastructure to receive tourists.

However, the responses to the interviews in this study demonstrate that management lacks more information, such as the adaptation of technical documents (articles and management plans) for NPA employees and users. The managing organs could request more scientific research related to geodiversity (such as geotourism) to the universities and working groups of the Consulting Board and Geoparque do Quadrilátero Ferrífero. In addition to the capacitation of tourism guides regarding

geotourism, as it was observed by Boggiani (2018), and confirmed by Jacobi, Fleury and Rocha (2004, p. 1) in PESRM, “the importance of guided visits for better performance of the activity, and of the valuable tool that NPAs represent in the process of building ecological and environmental knowledge”.

In the sampled parks, the central issue of the pioneer world park (of Yellowstone) reverberates: the protection of natural resources in the face of industrialization-urbanization. However, the relationship between the SNUC category with that of the IUCN (2008), parks and II respectively, is similar to the results observed by Pelizzaro et al. (2015, p. 31): parks “are to be managed according to the V guidelines (Terrestrial/Marine Protected Landscape)”, which is closer to the group of sustainable use than to that of full protection.

Eagles, McCool and Haynes (2002, p. 88) present, as one strategy and tactics to manage high levels of use of protected areas, the modification of the type of use and type of visitor, such as discouraging or banning harmful practices. An example could be to stimulate the interpretation and importance of a type of rock or mineral through an explanatory virtual QR Code when pointing the cell phone to it, instead of collecting a natural souvenir. This solution integrates geotourism with ecotourism as a product (BENTO; FARIAS; NASCIMENTO, 2020) to be offered by park managers, valuing geodiversity and biodiversity as interdependent parts of geo-ecosystems. Being “necessary interpretative means aimed at the interpretation of geological heritage, means that can also be used in activities aimed at ecotourism and geotourism” (MOREIRA, 2014, p. 24).

The Ministry of Tourism itself (MTUR, 2010, p. 29-30) points out activities practiced by ecotourism that are related to geotourism, such as: “observation of geological formations”, “visiting caves” and “interpretative trails”. In this view, geotourism may contribute to reaching the foundations of ecotourism as

segment of the tourist activity that uses, in a sustainable way, the natural and cultural heritage, encourages its conservation and seeks the formation of an environmental awareness through the interpretation of the environment, promoting the well-being of the populations.

Finally, Coutinho et al. (2019, p. 765) corroborate the geotourism-ecotourism interface:

The local benefits refer to the involvement of local communities in the whole process, from the management of the locality for geotourism to the provision of services that promote the generation of jobs and income. This involvement not only benefits the community and the environment, but it impacts the quality of the tourist experience.

Thus, principles of geotourism (and ecotourism) as the formation of an environmental conscience through interpretation, point out commitments to environmental conservation, which is sought both by parks and their managers.

FINAL CONSIDERATIONS

The management of geodiversity, whether in protected areas such as parks or in geoparks, is not an easy task. In spite of, in the end, partially being a theme debated by philosophers and religious people in ancient times, that has been reinforced by the emergence of Geology as a science and of Geotourism as field trips at the end of the 19th century in Europe. After the impact of industrialization and urbanization on nature, it emerged to the surface as a study area at the end of the 20th century.

If, on the one hand, tourists are impressed by mountains, canyons, waterfalls and other natural attractions, on the other they are also curious about their formation. For more people to continue to have access to geotourism, however, it is necessary to conserve them. Considering this offer (attractions) and this demand (visitors), geotourism has been consolidating itself as a tourist segment. This is the challenge for managers: integrating visitation and conservation through management.

The case studies presented here, added to the literature concerning this theme - demonstrated the perception of the managers regarding geotourism. It is noted that the study areas (Quadrilátero Ferrífero and Serra do Espinhaço), rich in biodiversity, geodiversity, and natural protected areas, represent the two sides of a coin: one is the scenic appeal of the landscape to ecotourism (especially ecological); and on the other is that there are pressures for land use and occupation (large urban centers and mining). The need for the development of geotourism by researchers (seeking to understand it better) and the dissemination of

their knowledge (application by managing organs of NPAs) is highlighted.

The results demonstrate the importance of interdisciplinarity in the study of NPAs, whose tourism does not occur only with the offer of attractions by public and private managers, but also by understanding their demand, that is, (geo) tourists and the receiving community. The present work thus adds to the other published ones on geotourism supply and demand, with the difference of being an important oral record for geoconservation actions. The type of conservation that Sharples (2002) considers crucial for the maintenance of biodiversity and also as a value in itself, independent of biotic resources.

However, a window of opportunity opens up to a scenario such as a landscape portrayed by naturalist painters. It is hoped that this study will serve more forcefully so that ICMBIO and IEF do not become “paper parks” in terms of geodiversity, and also help in the search for the effectiveness of this management with the aid of geotourism, whose interpretation of the characteristics and of geological, geomorphological, pedological and other natural heritage processes collaborates (in)directly for environmental education, and, consequently, for conservation.

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