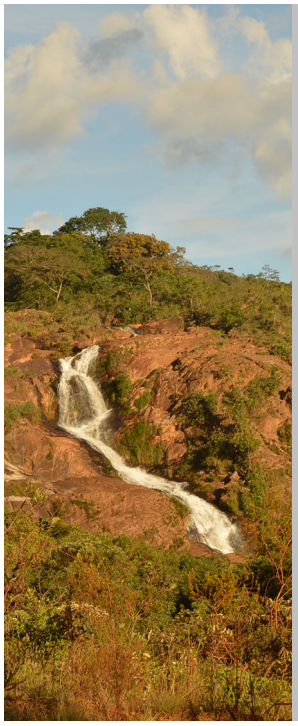

COLLAPSE OF NATIONAL PROTECTED AREAS IN BRAZIL: THE EXAMPLE OF MINAS GERAIS STATE

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ABSTRACT
Historically, Brazil has played a prominent role as a member of the Convention on Biological Diversity and as a signatory to the Paris Agreement on Climate Change and several other international environmental agreements. Aiming to evaluate the management of investment in protected areas during the past 12 years, we have analysed the annual budgets of National Protected Areas located in Minas Gerais. This state comprises three different biomes, including two hotspots. In all years, investments in sustainable use units were substantially lower than in areas of integral protection. For both groups, investments were particularly low in 2019, around 74 per cent lower than in 2018. Although we cannot say that this is a future trend, the current crisis in Brazil and the world leads us to believe that protected areas may be compromised if these areas are not adequately valued as sources of socio-environmental health.

Key words: budget cuts, ecosystem services, environmental conservation, environmental legislation, public policy, biological conservation

INTRODUCTION
In Brazil, 334 National Protected Areas have been created since 1937, and managed by the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) with the main objective to protect areas with high biotic and abiotic value and, following the creation of the Conservation Units National System (SNUC), to also valorise their cultural and social aspects.

However, the effective implementation of these protected areas still faces several challenges, such as the lack of basic infrastructure, insufficient employees and land regularisation issues (Medeiros et al., 2011). Although the simple act of protected area creation and implementation has positive effects on habitat loss reduction (Geldmann et al., 2013) and avoiding deforestation (Nolte et al., 2013), inadequate financial support limits its management effectiveness (Bruner et al., 2004; Medeiros et al., 2011).

Recent studies have demonstrated the great economic benefits of the protected areas network in Brazil, especially considering the tourism sector, which is responsible for generating an estimated R$2.5 to 6.1 billion[1] in revenue and 77,000 to 133,000 jobs in 2016 (Young & Medeiros, 2018). Protected areas are also important in climate change mitigation (Ricketts et al., 2010). For Brazilian protected areas, Young and Medeiros (2018) conservatively valued carbon stock services at R$130.3 billion, with annual benefits ranging from R$3.9 to R$7.8 billion due to avoided deforestation. They also calculated the annual contribution of Brazilian protected areas to the maintenance of water resources (R$59.8 billion), a monetary amount attributed to river protection for hydroelectric generation (the largest Brazilian energy source worth R$23.6 billion), erosion prevention (R$7.8 billion) and consumptive uses (irrigation, industry and human supplies, R$28.4 billion). These data, associated

with the fact that for each R$1 invested in the protected area system, R$7 was generated in economic benefits (Souza et al., 2017), evidence that allocating financial resources for the maintenance, expansion and improvement of protected areas cannot be considered as an expense, but as an excellent investment with considerable socio-economic benefits (Gantioler et al., 2010; Young & Medeiros, 2018).

Despite the undoubted socio-economic and environmental importance of protected areas, political movements in recent years have threatened this global biodiversity heritage. Events of protected area downgrading and downsizing have become more common in Brazil (Bernard et al., 2014), and a recent bill proposal even aims to repeal the newly created protected areas that have problems related to land tenure just five years after their creation (Silveira et al., 2018). Other bill proposals aim to weaken and alter the national environmental licensing system (Fearnside, 2016), while constant budget cuts are occurring in biodiversity conservation science (Magnusson et al., 2018). In addition, the current Brazilian Environment Ministry (MMA) has adopted measures that reduce the transparency of the Instituto Brasileiro do Meio Ambiente e dos Resursos Naturais Renováveis (IBAMA) and ICMBio, the largest federal agencies working on environmental management, crime investigation and preservation (Moraes, 2019).

Considering this scenario of serious setbacks in the Brazilian environmental agenda, we analysed the annual budgets for each of the National Protected Areas of Minas Gerais State from 2008 to 2019 to design possible solutions that may contribute to meeting the current financial challenge of maintaining appropriate management of these areas.

METHODS

We selected Minas Gerais (territorial area: 586,528 km²) due to its importance in the Brazilian environmental context, containing two world biodiversity hotspots, the Cerrado and Atlantic Forest (Mittermeier et al., 2004), as well as Caatinga, a biome where conservation actions have been lacking, and which is being threatened by habitat and biodiversity loss (Silva et al., 2017). Minas Gerais also has a unique ecosystem called *campos rupestres*, which is highly threatened by mining activities, especially in its ferruginous geosystems, which have a high rate of endemism and maintain large water reserves (Gama & Matias, 2015; Silveira et al., 2016; Carmo et al., 2018). Minas Gerais currently has 18 National Protected Areas implemented by the SNUC (Figure 1) with a total area of 1,573,662 hectares that protect, among other areas, watersheds of great national importance, such as the Rio Doce and Rio São Francisco basins, both recently impacted by major mining disasters (Carmo et al., 2017; Cionek et al., 2019; Santos et al., 2019).

For our analysis, we used only official data from government agencies: public data obtained on the website of the federal environmental agency (ICMBio), or requested through the Brazilian Law on Access to Public Information (Brasil, 2011). These data represent the financial amount allocated through Annual Budget Law (LOA) for each protected area, but not necessarily the amount spent in each year, due to possible blocking of budgetary allocations by the federal government, and do not include expenses relating to employees' pay. The annual values since 2008 were also readjusted for annual currency inflation using the IPCA (Consumer Price Index), always considering the reference period (of the previous year). The 2019 LOA values were not readjusted.

To calculate the annual investment per hectare for each protected area category: Integral Protection (IP, IUCN categories I and II) and Sustainable Use (SU, IUCN categories V and VI), we performed a weighted average considering the annual investment values and each category area. The variations in investment were calculated considering the ratio between the available 2019 values compared to 2018, as well as the average for all previous years (2008 to 2018) when necessary.

RESULTS AND DISCUSSION

The total budget originally allocated to the 18 National Protected Areas of the state of Minas Gerais in 2019 was R$3,955,382.76 – 73.63 per cent lower than in 2018 (R$14,997,515.85), the largest budget cut in the history of ICMBio (Figure 2).

Serra do Gandarela National Park © Matteus Ferreira

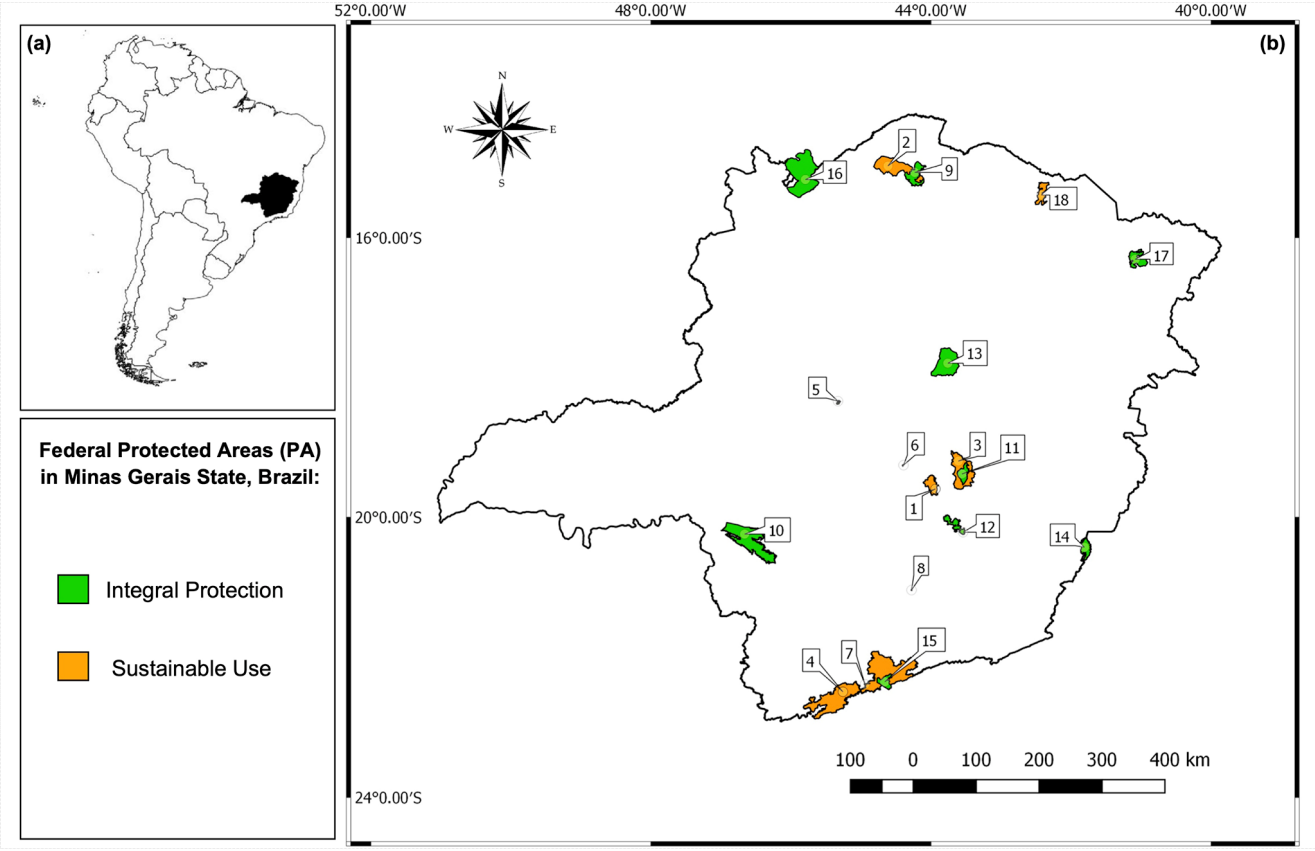

Figure 1. (a) Study area location, the 586.528 km² state of Minas Gerais, Brazil; (b) and the distribution of Federal Protected Areas (PA) of Integral Protection (Green) and Sustainable Use (Orange) in Minas Gerais State, Brazil: 1 – Carste de Lagoa Santa Environmental Protection Area (EPA); 2 – Cavernas do Peruaçu EPA; 3 – Morro da Pedreira EPA; 4 – Serra da Mantiqueira EPA; 5 – Pirapitinga Ecological Station; 6 - Paraopeba National Forest (NF); 7 – Passa Quatro NF; 8 – Ritápolis NF; 9 – Cavernas do Peruaçu National Park (NP); 10 – Serra da Canastra NP; 11 – Serra do Cipó NP; 12 – Serra do Gandarela NP; 13 – Sempre-Vivas NP; 14 – Caparaó NP; 15 – Itatiaia NP; 16 – Grande Sertão Veredas NP; 17 – Mata Escura Biological Reserve; 18 – Sustainable Development Reserve Nascentes Geraizeiras.

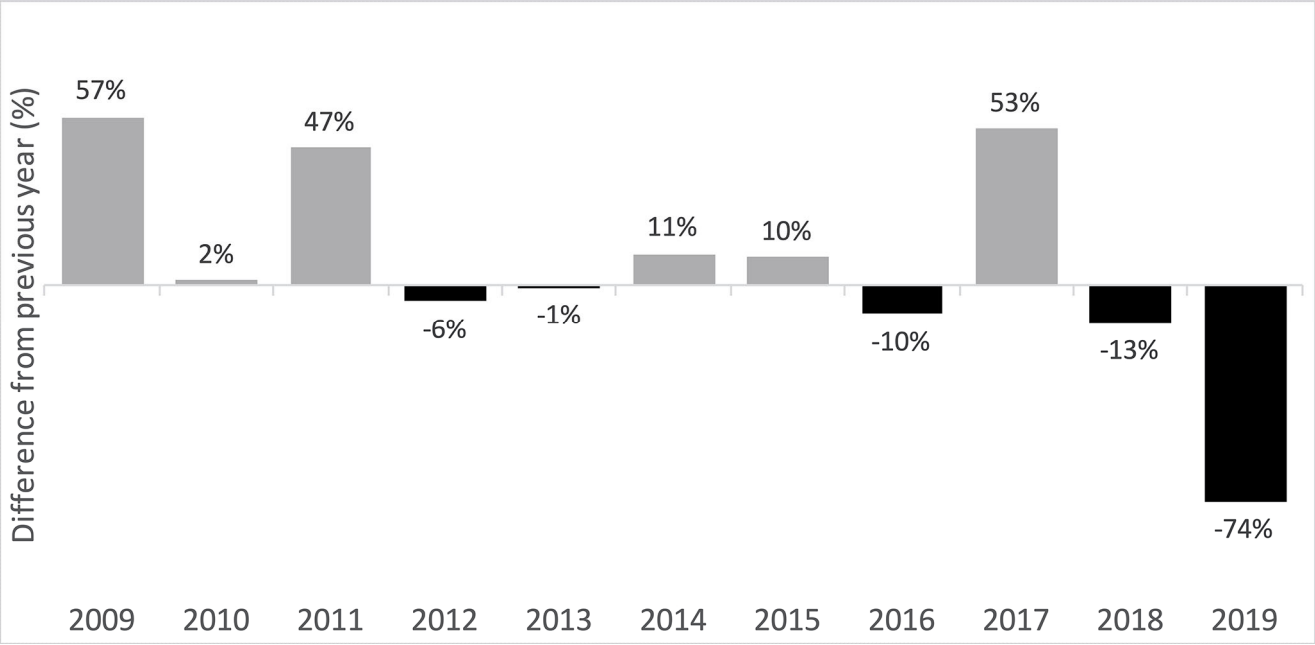

Figure 2. Budget changes (%) in National protected areas of Minas Gerais compared to all previous years of ICMBio (2009–2019). Annual values adjusted by IPCA (Consumer Price Index).

Analysing the budget cut in each category, there was a decrease of 50 per cent in Sustainable Development Reserves (IUCN VI), 64 per cent in National Parks (IUCN II), 86 per cent in Environmental Protection Areas (IUCN V), 93 per cent in Ecological Stations (IUCN 1a), 95 per cent in National Forests (IUCN VI) and 97 per cent in Biological Reserves (IUCN 1a) (Figure 3). As an example, the Environmental Protection Area Morro da Pedreira, which had a budget of R$218,960.58 in 2018, had no money in 2019. Caparaó National Park, despite its proven tourist appeal (62,157 documented visitors in 2017, ICMBio, 2019), also suffered a drastic budget reduction, diminishing from R$1,224,303.50 in 2018 to R$77,814.47 in 2019 (a 93.64 per cent decrease). The detailed values for each of the protected areas can be found in the Supplementary Material.

When we analysed the annual investments per hectare (R$/ha) for Sustainable Use (IUCN IV, V and VI) and Integral Protection (IUCN I and II) categories, the figures were alarming (Figure 4). In 2018, the average annual funding was R$2.94/ha for the SU category and R$16.16/ha for the IP category. Whereas in 2019, only R$0.33/ha and R$4.71/ha were planned, which corresponds to a reduction of 88.77 per cent and 70.85 per cent, respectively. When 2019 values are compared with the annual average from 2008 to 2018, the reduction was 87.29 per cent for SU and 62.09 per cent for IP, demonstrating that this budget decrease is unprecedented in the history of ICMBio.

The historical environmental neglect has worsened in the budget prediction for 2019, generating worrying uncertainties about future government budgets for National Protected Areas in Brazil. Investments are required to solve problems related to land tenure in several protected areas, including the oldest protected area in Brazil. Itatiaia National Park which was created in 1937 but where tenure issues are not yet fully resolved. Another urgent need of the Brazilian protected area system is the elaboration and update of management plans, the most important mechanism established by law to guarantee protected areas' management. Seven of 18 protected areas have management plans that have not been updated for 10 or more years, and five do not even have a management plan (ICMBio, 2019). This goes against the SNUC law (9.985/2000) that requires management plans to be approved within five years after the creation of a protected area (Brasil, 2000). The insufficient budget allocation for these mandatory activities compromises the management effectiveness of these areas (Leverington et al., 2010) and, consequently, their conservation goals. When we compare the federal investments in the protected areas assessed with those of other countries, we see striking differences. United States, South Africa and Argentina invested in 2010, R$ 156.12/ha, R$ 67.09/ha and R$ 21.37/ha, respectively (Medeiros et al., 2011). These amounts are much higher than those invested in the Brazilian protected areas analysed (4.43 R$/ha) for the same period (Medeiros et al., 2011).

In addition, Brazil has demonstrated weaknesses related to environmental issues, as evidenced by ideological statements about the Paris Agreement (Rochedo et al., 2018), controversial projects (Abessa et al., 2019) and the censorship of agency data (Tollefson, 2019). These actions compromise the conservation of biodiversity and

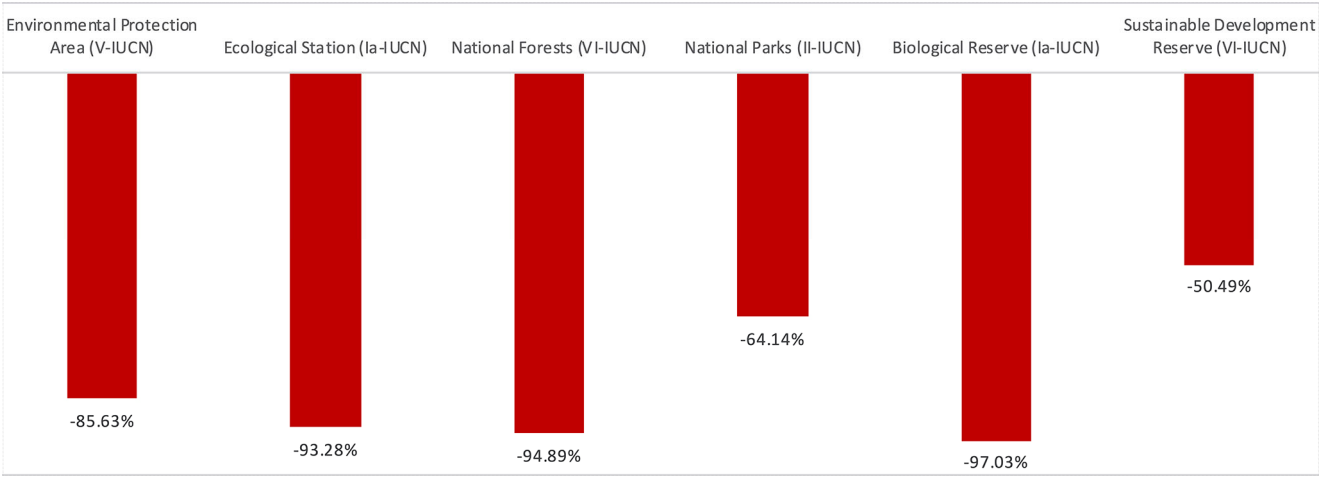

Figure 3. Budget changes (%) in each National protected areas category of Minas Gerais comparing 2019 with 2018. Annual values adjusted by IPCA (Consumer Price Index).

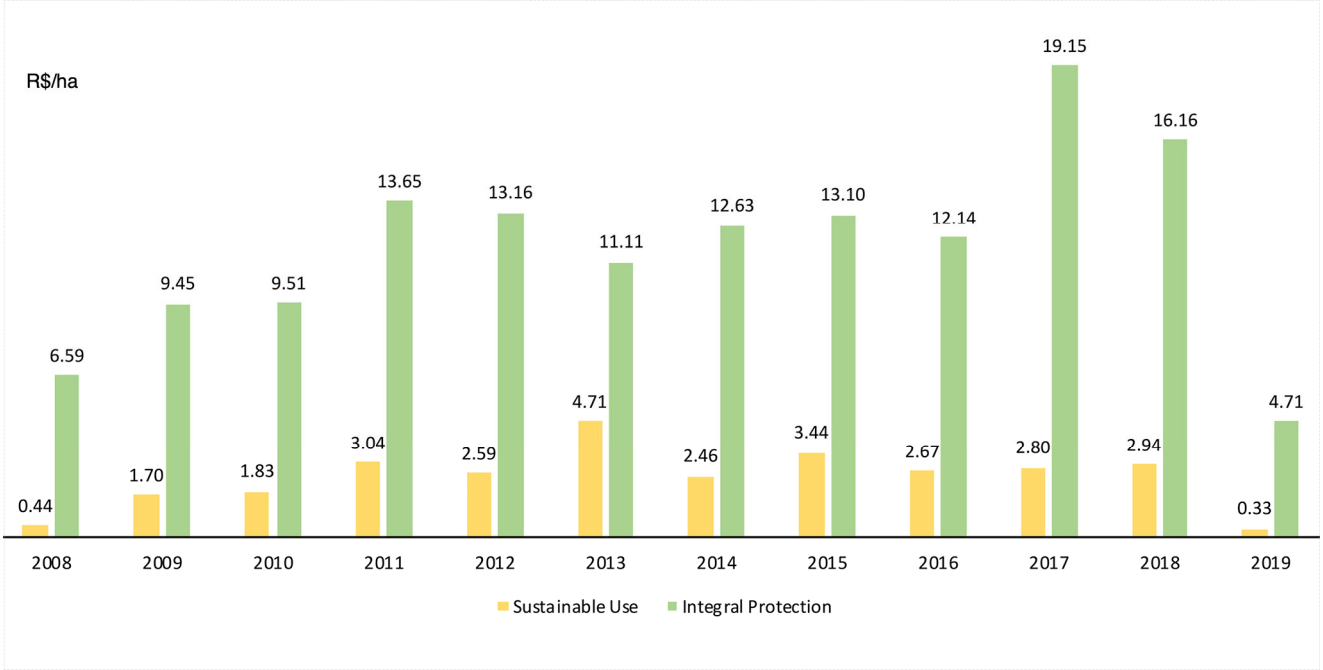

Figure 4. Annual budget per area (R$/hectares), for Federal Protected Areas of Sustainable Use (Orange) and Integral Protection (Green). Annual values adjusted by IPCA (Consumer Price Index)
R$1 = US$0.19 at current exchange rate, 14 September 2020.

the mitigation of climate change effects (Ferrante & Fearnside, 2019). The reduction in international financial resources for the Amazon region (Mendes, 2019) aggravates this scenario since few existing Brazilian federal government resources can be reallocated to overcome this financial deficit, with future impacts on protected areas outside the Amazon region.

Adequate funding, equipment and infrastructure are necessary to increase the management capacity of protected areas, especially in developing countries (Leverington et al., 2010). Different strategies can be adopted to address these issues, such as mandatory environmental offsets by the private sector, and tax benefits. An example is the 'ICMS Ecológico' (Minas Gerais Law 18030/09) (Young, 2005), which is based on a monetary redistribution criterion generated by the Goods Circulation Tax (ICMS) to municipalities. The financial amount that is redistributed to each municipality is determined by a multifactor assessment, including protected area size (hectares), categories, and protected area Quality Factor (QF) (Minas Gerais, 2009). For instance, an improvement of QF by planning, infrastructure, personnel and land tenure can generate more financial resources for the municipalities that host protected areas and encourage projects to promote conservation. As an example, São Roque de Minas (one of the six municipalities that host Serra da Canastra National Park) received R$ 638.303,95 in 2019 from the ICMS Ecológico Law just because of the existence of this protected area (FJP, 2020). However, this value can be more than doubled if the park raises its QF (it was 0.42 – 0.50 in 2019 and is allowed to reach a maximum value of 1.00).

Another possibility for generating more financial resources for national parks is granting concessions for visitor support services to the private sector (ICMBio, 2020). Protected area concessions should be carefully evaluated to avoid waste, habitat destruction and the displacement of local people and wildlife (Wyman et al., 2011). Best practices, like well-defined concession qualifications, and legal and financial responsibilities, are needed to guarantee a financial gain while maintaining the preservation and conservation goals of protected areas (Wyman et al., 2011).

The national system of protected areas in Brazil faces many challenges. Financially, it is necessary to implement a transparency of information system to help public and private sectors, scientists and other stakeholders track and assess the needs of each protected area at different scales (Silva et al., 2019). Also, resource allocation from sectors that generate positive socio-economic results, directly and indirectly,

should be a major goal of any government , regardless of their political view. Partnerships between protected areas, the private sector and especially with surrounding communities can guarantee that these precious assets continue to contribute to the conservation of biodiversity and its ecosystem services.

ENDNOTES

[1]R$1 = US$0.19 at current exchange rate, 14 September 2020

SUPPLEMENTARY ONLINE MATERIAL

Annual federal budgets for national protected areas of Minas Gerais State, Brazil

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Serra da Canastra National Park © Matteus Ferreira

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RESUMEN

Históricamente, Brasil ha desempeñado un papel destacado como miembro del Convenio sobre la Diversidad Biológica y como signatario del Acuerdo de París sobre el Cambio Climático y varios otros acuerdos internacionales relacionados con el medio ambiente. Con el fin de evaluar la gestión de las inversiones en las áreas protegidas durante los últimos 12 años, analizamos los presupuestos anuales de las áreas protegidas nacionales situadas en Minas Gerais. Este estado comprende tres biomas diferentes, incluyendo dos lugares de situación crítica de la biodiversidad. En todos esos años, las inversiones en unidades de uso sostenible fueron sustancialmente inferiores a las de las áreas de protección integral. En ambos grupos, las inversiones fueron particularmente bajas en 2019, alrededor de un 74% menos que en 2018. Aunque no podemos decir que esta sea una tendencia que continuará en el futuro, la crisis actual en Brasil y en el mundo nos lleva a creer que las áreas protegidas podrían verse comprometidas si no son adecuadamente valoradas como fuentes de salud socioambiental.

RÉSUMÉ

Historiquement, le Brésil a joué un rôle de premier plan en tant que membre de la Convention sur la diversité biologique et signataire de l'Accord de Paris sur les changements climatiques et de plusieurs autres accords internationaux sur l'environnement. Dans le but d'évaluer la gestion des investissements dans les aires protégées au cours des 12 dernières années, nous avons analysé les budgets annuels des aires protégées nationales situées dans le Minas Gerais. Cet état comprend trois biomes différents, dont deux hotspots. Chaque année, les investissements dans les unités d'exploitation durable ont été sensiblement inférieurs à ceux des zones de protection intégrale. Pour les deux groupes, les investissements ont été particulièrement faibles en 2019, environ 74% de moins qu'en 2018. Bien que nous ne pouvons pas affirmer que ce soit une tendance future, la crise actuelle au Brésil et dans le monde nous porte à croire que les aires protégées pourraient être compromises si elles ne sont pas suffisamment reconnues et valorisées en tant que sources de santé socio-environnementale.