v. 67, p. 104-124, Jan./Jun. 2026 http://doi.org/10.5380/dma.v67i.98790 e-ISSN 2176-9109

DMA Desenvolvimento e Meio Ambiente

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Occurrences and causes of non-compliance and weak environmental performance in the follow-up stage of environmental licensing and impact assessment: an analysis of the Minas Gerais licensing system

Ocorrências e causas de descumprimento legal e baixo desempenho ambiental após a obtenção de licença ambiental: uma análise do licenciamento mineiro

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Article received on **March 5, 2025**

Final version accepted on **November 6, 2025**

Published on **April 28, 2026**

Abstract: Although the granting of environmental licenses is conditioned on the implementation of monitoring, mitigation, and compensation programs for environmental impacts, there are several barriers to compliance with these requirements. This study aimed to understand these barriers by identifying and analyzing the occurrences and causes of legal non-compliance and the weak environmental performance of licensed projects in the state of Minas Gerais. The research was based on an analysis of 232 processes of projects that renewed their environmental licenses, along with an in-depth case study of a metallurgical project in Ouro Preto (MG) that had its application for license renewal denied. Methodologically, the study employed content analysis of documents and 12 semi-structured interviews. The findings revealed frequent and recurring irregularities among the projects that renewed their licenses, indicating that state oversight and sanctions are often delayed and inadequate, and suggesting a possible connivance of the state government with the non-compliance of legal requirements and other commitments. The case study showed that Terms of Adjustment of Conduct do not necessarily lead to behavioral adjustments. Finally, the study discusses practical and academic implications.

Keywords: environmental licensing; post-licensing; irregularities; causes; Minas Gerais; Brazil.

Resumo: Embora a concessão de licenças ambientais seja condicionada à implementação de programas de monitoramento, mitigação e compensação de impactos ambientais, existem diversas barreiras para a observância desses requisitos. Este estudo buscou compreender tais barreiras identificando e entendendo as ocorrências e causas de descumprimentos legais e baixo desempenho ambiental de empreendimentos licenciados no estado de Minas Gerais. O estudo baseou-se em uma análise de 232 processos de empreendimentos que renovaram licenças ambientais e um estudo de caso mais aprofundado de um empreendimento metalúrgico em Ouro Preto (MG) que teve licença indeferida. Metodologicamente foram utilizadas análises de conteúdo documental e 12 entrevistas semiestruturadas. O estudo identificou irregularidades frequentes e recorrentes nos empreendimentos que renovaram licenças, que a fiscalização e sanções do Estado ocorrem tardia e precariamente, e que aparenta haver conivência do governo do estado com os descumprimentos de requisitos legais e outros compromissos. O estudo de caso revelou que os Termos de Ajustamento de Conduta não necessariamente ajustam conduta. O estudo finalmente discute as implicações práticas e acadêmicas.

Palavras-chave: licenciamento ambiental; pós licença; irregularidades; Minas Gerais; Brasil.

1. Introduction

Environmental licensing is one of the most widely used instruments worldwide to enable the rational use of natural resources with environmental responsibility and to promote environmental protection. In Brazil, environmental licensing is one of the environmental policy instruments established by Law No. 6,938 of 1981, and the environmental license is the administrative act and legal instrument instituted to set the conditions, restrictions, and control measures that must be complied with by the developer (Conselho Nacional do Meio Ambiente [CONAMA], 1997). The environmental agency is responsible for overseeing and monitoring the licenses it grants (*Lei n° 6.938*, 1981).

To support and enable oversight and enforcement by the federative entities in Brazil, Law No. 9,605 of 1998 was enacted. This law establishes criminal and administrative sanctions for environmentally harmful conduct and was regulated by Decree No. 6,514 of 2008 (*Lei n° 9.605,* 1998; *Decreto n° 6.514,* 2008). With respect to environmental licensing, the law defines as environmental crimes any conduct harmful to the environment, including operating an activity without a license or without authorization from the competent environmental agencies, or in violation of legal and regulatory licensing requirements (*Lei n° 9.605,* 1998).

In the state of Minas Gerais, environmental licensing is preventive, and the entrepreneur is obliged to operate with an environmental license (*Deliberação Normativa Copam* nº 217, 2017). Although preventive licensing is the rule, the state allows corrective regularization upon proof of environmental feasibility, without prejudice to the application of environmental sanctions (*Decreto* n° 47.383, 2018). The continuation of operations by an irregular project depends on the signing of a Conduct Adjustment Agreement (whose acronym in portuguese is "TAC") with the competent environmental agency, which is independent of the formalization of the licensing process (*Decreto* n° 47.383, 2018).

Environmental impacts and the establishment of conditions in environmental licenses must comply with the guidelines of maximizing positive impacts and avoiding, minimizing, or compensating negative impacts of the activity or project. The licensing agency is responsible for monitoring, overseeing, and enforcing the approved licenses and their conditions (*Deliberação Normativa Copam* nº 217, 2017). In this context, once an environmental violation is identified, it is the duty of the environmental agency to apply the appropriate sanctions (*Decreto* n° 47.383, 2018). For that purpose, Decree No. 47,383 of 2018 of the state of Minas Gerais includes an annex containing infraction codes for potential irregularities committed during the validity of the environmental license (*Decreto* n° 47.383, 2018). If such irregularities are classified as environmental crimes, the Public Prosecutor's Office of Minas Gerais (MPMG) is also responsible for initiating judicial actions for criminal prosecution and damage reparation.

The environmental agency must ensure public access to documents, records, and environmental licensing processes, as well as the results of oversight and enforcement actions, as established by Law No. 15,971 of 2006 (*Lei n° 15.971*, 2006). Among its obligations is the publication of licensing requests, renewals and grants, notices of violation, corresponding penalties imposed, and the execution of conduct adjustment agreements (*Lei n° 15.971*, 2006).

Despite growing regulatory sophistication in the management of environmental licensing processes, shortcomings in the monitoring of environmental licenses have been identified in numerous scientific studies, such as Gallardo et al. (2016), Pinto et al. (2019), Glasson (2022) and Arts and Morrison-Saunders (2022). Minas Gerais is no exception: irregularities have been documented by academic studies, including Prado Filho and Souza (2004), Santiago et al. (2016) and Queiroz and Almeida (2016), but empirical studies particularly those addressing the frequency and causes of irregularities are still scarce.

This study therefore aimed to identify, characterize, and understand the occurrences and causes of legal noncompliance in licensed activities and projects in the state of Minas Gerais. The research was based on literature reviews, regulatory analyses, content analysis of environmental licensing processes, and an in-depth case study of an alumina plant located in Ouro Preto, which involved, among other methods, semi-structured interviews.

The article is divided into four sections, including this introduction. The next section describes the methodology. Section 3 presents the results and discussion, and Section 4 highlights the main conclusions and practical and academic implications of the study.

2. Methodology

2.1. Methodological approaches and stages

The research was based on a mixed sequential investigation, combining quantitative and qualitative analyses of different types of environmental licensing processes. As illustrated in the flowchart (Figure 1), there were two main methodological stages. The first consisted of a quantitative analysis of 232 processes that resulted in renewed environmental licenses between January 2020 and August 2022 in the state of Minas Gerais. These 232 processes, identified in the archives of the state's licensing agency, reflect the historically predominant situation in Brazil and internationally: the approval of environmental licensing requests (Fonseca & Gibson, 2021). In other words, because these processes were approved, they indicate situations of potential legal compliance and environmental performance. Parallel to the quantitative analysis of these 232 processes, the study conducted an in-depth examination of a rarer case – one involving the denial of

an environmental license – which represents a situation of potential legal noncompliance and weak environmental performance. Because such cases are uncommon, the research adopted a more detailed qualitative approach. The selected case concerned a metallurgical industry whose environmental license was not renewed in the municipality of Ouro Preto. The results of these two parallel investigative stages were subsequently discussed and qualitatively analyzed in a final stage synthesizing the findings.

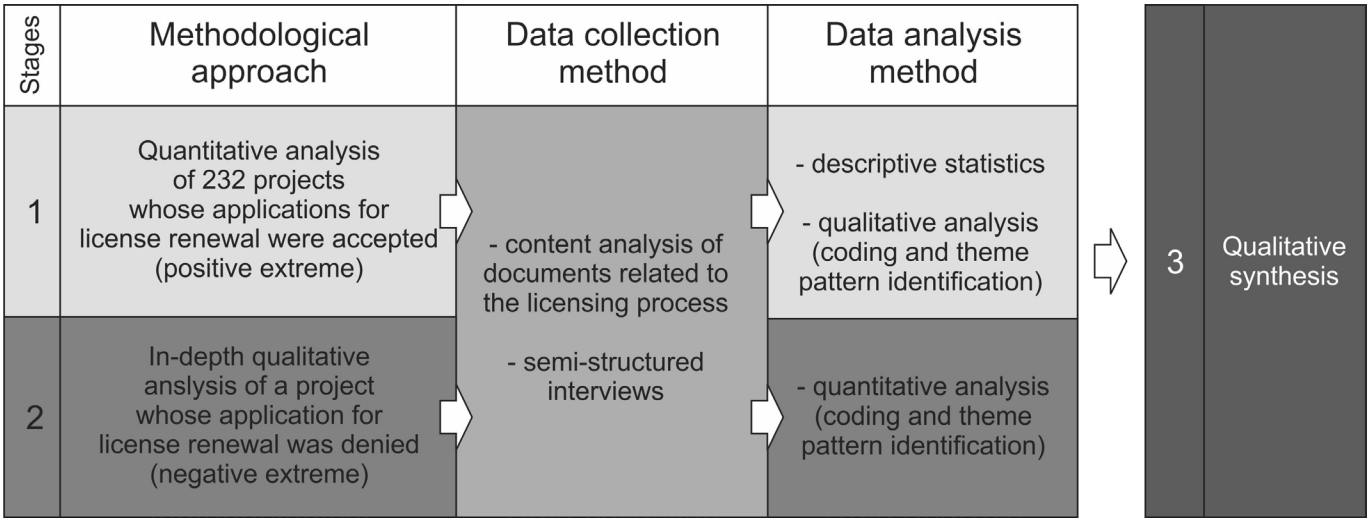
Data collection for both initial stages (Figure 1) relied on content analysis and semi-structured interviews. However, the data analysis in stage 1 (quantitative) incorporated descriptive statistics in addition to qualitative analysis and synthesis, while stage 2 consisted solely of qualitative analyses and synthesis.

2.2. Study Area

The study focused on the state jurisdiction of Minas Gerais, which was selected based on its geographic and demographic relevance, as well as the accessibility of the environmental agency's records. The government of Minas Gerais, through its regional branches, has the authority to analyze renewal applications for environmental licenses, conduct oversight and enforcement of licensed activities, and apply sanctions when appropriate, in accordance with Decree No. 48,707 of October 25, 2023 (*Decreto n° 47.383*, 2018; *Lei n° 23.304*, 2019a; *Decreto n° 47.787,* 2019b, *Decreto n° 48.707*, 2023).

For the qualitative case study, an arbitrarily selected metallurgical operation with a non-renewed license was chosen. This operation involves the production of non-ferrous metals (alumina), an industrial waste containment dam, and a waste or tailings pile, operated by Actech – Alumina Chemical Technology Ltda. The company acquired the assets of Hindalco do Brasil Indústria e Comércio de Alumina Ltda (Secretaria de Estado de Meio Ambiente e Desenvolvimento Sustentável [SEMAD], 2023a). It is located in the municipality of Ouro Preto, whereas the 232 analyzed pro-

Figure 1
Methodological flowchart of the research.



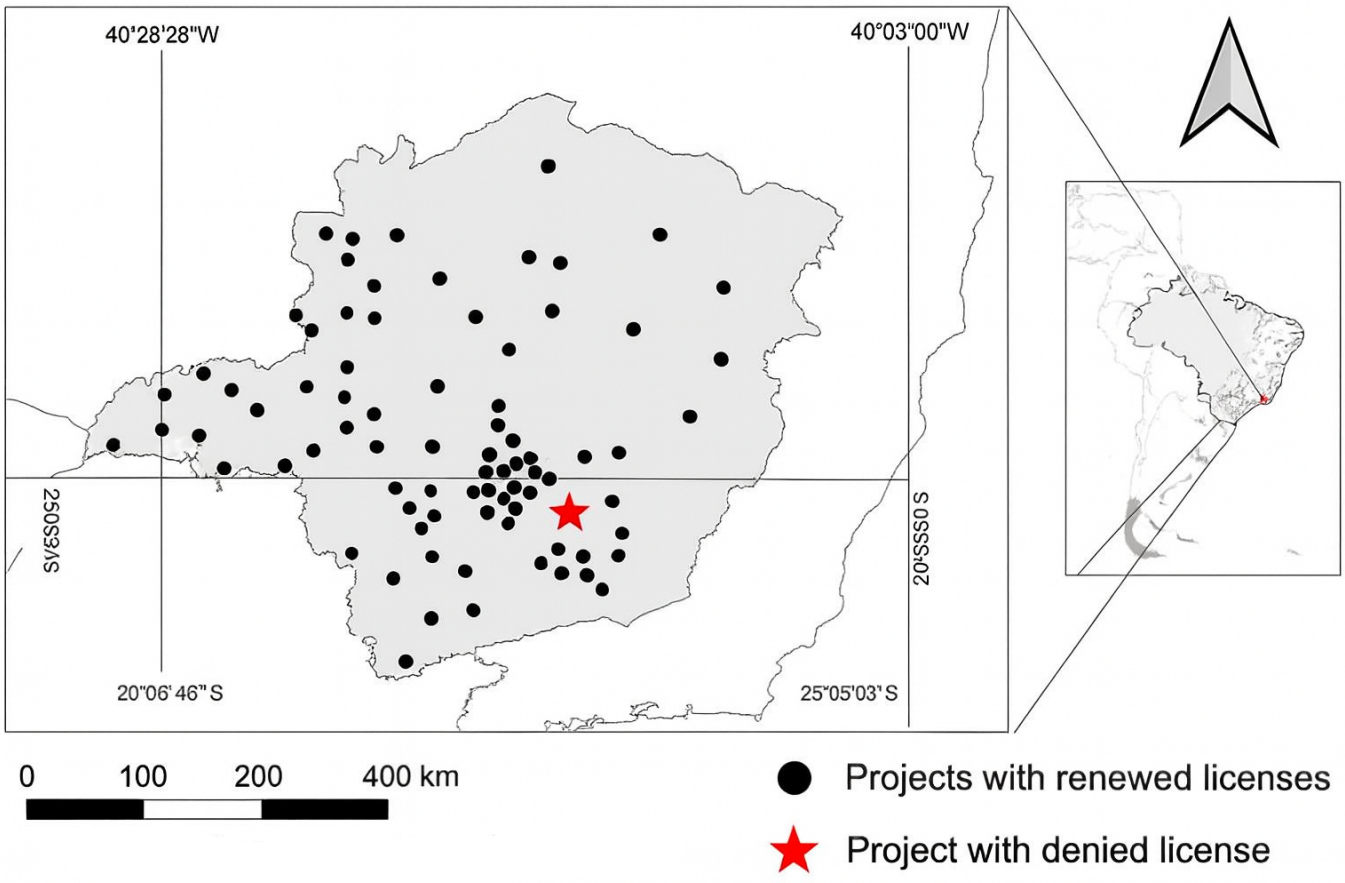
cesses are distributed throughout the state of Minas Gerais, as shown in Figure 2.

2.3. Stage 1: Quantitative Analysis of Processes with Renewed Environmental Licenses

The analysis of processes with renewed licenses began on September 25, 2021, and was completed on August 25, 2022. The consultation encompassed renewal processes for environmental licenses that were approved and made available on the website managed by the State Secretariat for the Environment and Sustainable Development (SEMAD), related to environmental licensing decisions (SEMAD, 2022a). After identifying the processes, the documents required for the study were accessed through the websites of the Integrated Environmental Information System (SIAM) (SEMAD, 2022b), the Ecosystems Environmental Licensing System SEMAD, 2022c), and the Environmental Transparency Portal: Monitoring of Notices of Violation and Processes (SEMAD, 2022d), all publicly accessible. The identified documents were saved digitally, and documents not found on the available websites were formally requested from SEMAD via the Electronic Information System (SEI).

Figure 2

Location map of projects in Minas Gerais with renewed licenses and with denied licenses.



2.3.1. Stage 1 – Data Collection Methods: Document Content Analysis and Semi-Structured Interviews

A total of 232 environmental license renewal processes were identified and selected. Additionally, one non-renewed license case was arbitrarily chosen. With respect to documentary content, the following documents were analyzed: granted licenses; Environmental Performance Assessment Reports (RADAs); license monitoring reports; technical reports; and notices of violation. The accessibility of these documents to the public was also assessed using a checklist (Table 2) to guide content analysis and data recording.

To understand the occurrences and causes of the irregularities identified in the study, semi-structured interviews were also carried out with individuals familiar with environmental licensing in Minas Gerais, the project under study, or who had participated in related administrative proceedings. Interviewees included staff from the environmental agency; consultants; decision-makers; representatives of the municipal executive and legislative branches; the Public Prosecutor's Office; and the affected community, as shown in Table 1. Semi-structured interviews followed a question script composed of basic, predefined questions aligned with the research objectives (Manzini, 2012).

Interviews were conducted via videoconference and recorded, facilitating research efficiency and content analysis given the geographic dispersion of participants. The researcher's role included preparing the semi-structured script with guiding questions (Tables 2 and 3), conducting the interviews, and interpreting the collected data.

At least 25 individuals familiar with licensing in Minas Gerais and/or with the project were invited; however, only 12 agreed to participate and contribute to the research. Despite the relatively small number of participants, the resulting content was sufficient to understand issues not evident in the documentary analyses, and these will be presented in the results section. The study was approved by the Research Ethics Committee (CEP), in compliance with CNS Resolutions 466/2012 and 510/2016.

2.3.2. Stage 2 – Methods of Data Analysis for Documents and Semi-Structured Interviews

For the quantitative analysis of the documents included in the 232 processes, frequencies and percentages were used to evaluate the persistence of irregularities following corrective licensing, administrative sanctions applied to projects, noncompliance with license conditions, automatic license extensions, and activities operating without a license and without a Conduct Adjustment Agreement (TAC).

For the analysis of data obtained from the interviews, recordings were transcribed to facilitate coding, and the analysis focused on interpreting the content of both recordings and transcripts. The goal was to identify re-

Table 1 Number, profile, and code of interviewees.

Institution	Category	Assignment	Number of interviewees	Interviewee codes	Comments
SEMAD	State Executive	Responsible for performance analysis and issuing technical opinions for licensing	03	GovEA 1 GovEA 2 GovEA 3	Did not participate in the case study process, but are familiar with the licensing process
Denied license case	Entrepreneur	Former employee of the project	01	Empr 1	Knows the project
Legislative power	Municipal Legislature	Legislate, among other duties	02	LegMu 1 LegMu 2	Familiar with the case study project due to complaints from the affected community
Municipality of Ouro Preto	Municipal Executive	Implement regulations, among other municipal government activities	01	GovMu 1	Familiar with the case study project due to complaints from the affected community
Neighborhood representatives	Directly affected community	Act on behalf of the community	03	Comu 1 Comu 2 Comu 3	Familiar with the case study project
MPMG	–	Responsible for litigating issues related to diffuse rights	02	MinP 1 MinP 2	Familiar with the case study project due to complaints from the affected community

sponse patterns, perceptions of the causes and persistence of irregularities, and details not evident in the documentary analyses.

2.4. Stage 2: Qualitative Analysis of the Case Study

2.4.1. Stage 2 – Data Collection Methods

The case study involves a project whose environmental license was not renewed. Data regarding the process in which the license was denied were collected through the digital platforms managed by SEMAD, as referenced in Section 2.3. Data collection took place between October 2023 and April 2024. Most documents were accessed publicly, but it was also necessary to formally request SEMAD to release documents through the Electronic Information System (SEI), as some were not available for public access. During the same period, potential environmental lawsuits were also investigated through the public portal of the Court of Justice of Minas Gerais (www.tjmg.jus.br). The goal was to identify any legal actions filed by the State of Minas Gerais or by the Public Prosecutor's Office of Minas Gerais

Table 2 Checklists used in the documentary analyses and semi-structured interviews.

Guiding questions for the content analysis of the 232 licensing processes
Was the project installed under the previous license?
Did the projects that obtained a license prove compliance with the conditions established in the renewed license?
Did the projects comply with the environmental obligations established in the renewed license?
Did the reports describe noncompliance with environmental regulations during the period of the renewed license in the RADA?
Did the reports describe noncompliance with regulations?
Did the reports mention noncompliance with conditions established in the license?
Were notices of violation issued against the entrepreneur during the period of operation of the project and execution of conduct adjustment agreements?
What were the reasons for the violation(s)?
What is the nature of the violations? (L: minor; G: serious; GMA: very serious)
How many minor violations?
How many serious violations?
How many very serious violations?
Was environmental damage/environmental pollution identified?
When a Conduct Adjustment Agreement (TAC) was signed, were its requirements met?
Guiding questions for interviews related to the 232 renewed licensing processes
What is the interviewee's professional role?
As a citizen, have you ever tried to access the State's environmental information?
What is your opinion on the signing of a TAC to allow a project to operate without a license or with an expired license?
Can you say whether TACs are monitored by the environmental agency?
Based on your experience, do you identify obstacles or barriers to efficient management in the monitoring of environmental licenses given the persistence of irregularities in renewed license processes?
What are the important means for improving governmental control in the monitoring of environmental licenses?

(MPMG) in response to the environmental violations committed, some of which were classified as environmental crimes. The search required using the corporate name of the project under study. Interviews were also conducted with a focus on the case study, following the guiding questions listed in Table 3.

2.4.2. Stage 2 – Data Analysis Methods

The data collected were organized in spreadsheet software to facilitate the identification of the most relevant information, following the methodological approach of Krippendorff (2004), which involves three steps: coding, categorization, and interpretation of the data.

2.5. Stage 3: Qualitative Synthesis of Stages 1 and 2

Stages 1 (analysis of 232 renewed licenses) and 2 (in-depth case study of the denied license) generated different qualitative and quantitative information. These results were compared in an integrated manner in order to

Table 3 Checklist used in the semi-structured interviews of the case study.

Guiding questions for the interviews related to the denied-license case study
Are you aware of the community's complaints regarding the operation of the project under study?
As a citizen, have you ever tried to access the State's environmental information, particularly regarding the project in the case study?
Do you have knowledge of any actions taken by the Municipal Executive Branch, the Legislative Branch, the MPMG, or the local association to seek a solution to the alleged irregularities committed by the project under study and in response to community complaints?
What is your opinion about the signing of a Conduct Adjustment Agreement (TAC) to allow the operation of the project under study, whose license was denied?
Based on your experience, do you identify obstacles or barriers to efficient management in the monitoring of environmental licenses given the persistence of irregularities in renewed licensing processes?
What positive and negative impacts of the company's operation on the municipality have you perceived?
Other case-study-related questions, which will be developed according to interviewee responses.

understand the factors that could explain the irregularities found both in processes with renewed licenses and in the process with a denied license.

3. Results and Discussion

3.1. Analysis of 232 Approved License Renewal Processes

The analysis of the 232 processes revealed several shortcomings in the monitoring of environmental licenses in the state of Minas Gerais. The documents reviewed indicated that among the renewed licenses (232), at least 35% (80) were corrective licenses, i.e., licenses granted to projects that had been operating illegally (Figure 3-a). Of these originally irregular projects, 58 continued to present performance problems reported in the RADA. Therefore, 72% of irregular projects (licensed through corrective procedures) remained noncompliant but still had their environmental licenses renewed (Figure 3-d).

Environmental obligations and license conditions are repeatedly violated or fulfilled after the established deadlines, as identified during the analysis of renewal requests. Nearly 90% of projects received administrative sanctions due to legal violations: 56 projects reported problems in their own RADAs, and 172 violations were confirmed by the technical assessment reports issued by the environmental authority (Figures 3-b-c-d). Violations related to noncompliance with license conditions occurred in more than 70% of the processes analyzed – that is, 163 out of 232 processes showed problems related to unmet conditions.

Despite these violations, most licenses (192) were automatically extended, as allowed by regulation, due to the environmental authority's failure to issue decisions within the legal timeframe. This lack of timely action, combined with the agency's irregular monitoring of licenses, contributed

to the persistence of noncompliance during the validity of renewed licenses (Figure 3-c). The absence of a Conduct Adjustment Agreement (TAC), or a lack of information confirming its execution, allowed 25 projects to continue operating without a valid license and without the TAC required by regulation, due to the failure to submit renewal applications within the legally established timeframe and the absence of state action to suspend activities. These irregularities are summarized in Figure 3.

The State's repeated decisions to renew environmental licenses accompanied by environmental performance assessment reports considered incipient, the absence of evidence of compliance with environmental obligations, environmental damages identified in notices of violation issued during the validity of the renewed license and without any forecast for environmental recovery, among other shortcomings, reveal that noncompliance with environmental rules in the monitoring of environmental licenses is both common and recurrent in the state of Minas Gerais.

Recognizing the challenges associated with environmental performance in the post-licensing phase – particularly the lack of criteria for license renewal – the state of Minas Gerais enacted Decree No. 48,640/2023, establishing that the analysis of environmental license renewal processes must follow environmental performance evaluation criteria to be defined by Resolution. In accordance with this directive, SEMAD, together with the State Environmental Foundation (FEAM) and the Minas Gerais Water Management Institute (IGAM), issued Resolution No. 3,263/2023, which created the Environmental Performance Index (IDAL). This index aims to assess whether the granting of new environmental licenses during renewal processes is appropriate. Its evaluation is based on four main axes: compliance with license conditions, self-monitoring programs, occurrence of nonconformities, and the record of critical events (*Decreto n° 48.640*, 2023). Although the IDAL represents progress by introducing greater transparency, objectivity, and quantification into environmental performance assessments, it remains unclear whether it is binding in decision-making. Nevertheless, it is essential that the state government, when implementing the IDAL or similar initiatives, consider the particular factors that influence environmental performance, including those addressed in this study.

3.2. Case Study Analysis

The case study involved a documentary analysis of an environmental licensing denial process – a relatively rare situation in practice and one already discussed in the academic literature (Fonseca & Gibson, 2021). The company currently responsible for the project is Alumina Chemical Technology (ACTECH), which has operated under this name since 2022 in the production of alumina from bauxite, located on Avenida Américo Reneé Gianetti, in Ouro Preto (Figure 2). ACTECH's activities fall under Class 5, according to COPAM Normative Deliberation No. 217/2017, and at

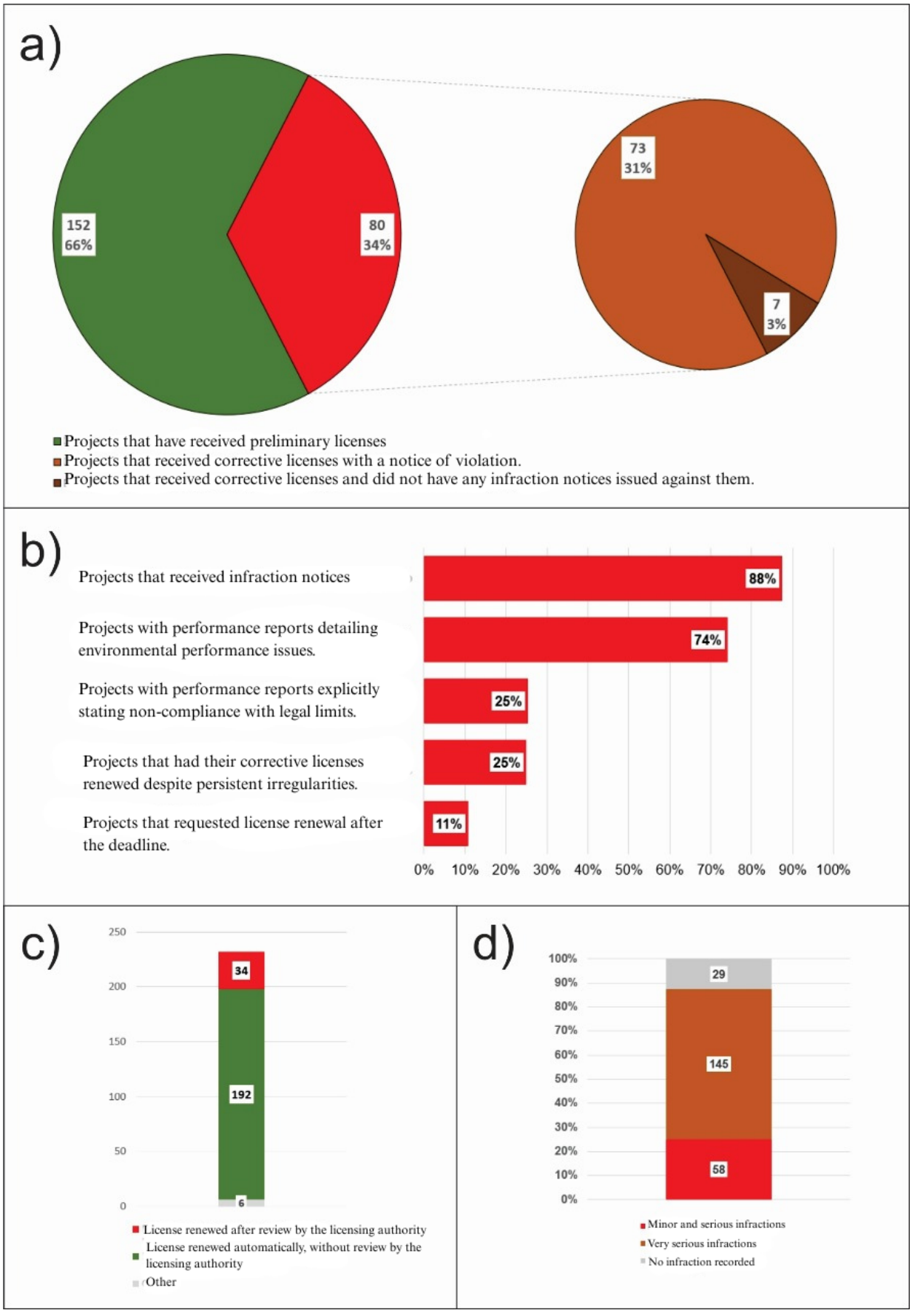


Figure 3
Frequency of irregularities identified in environmental license renewal processes (232).

the time of writing this article the project was undergoing corrective environmental licensing under process SLA No. 2073/2023 (SEMAD, 2023a). Its operations include metallurgy for the production of hydrates and specialty aluminas (24.17 ha of usable area), waste piles (4.6 ha), and an industrial waste containment dam (SEMAD, 2023a). The license denial occurred within the scope of process No. 16366/2013/005/2018 (SEMAD, 2021a). At that time, the company responsible for the operation was Hindalco do Brasil Indústria e Comércio de Alumina Ltda. The reasons for the denial included the inefficiency of the environmental control measures adopted; noncompliance with installation and operation phase conditionalities; and poor environmental performance, according to the Supram Sul report (SEMAD, 2021b).

The Operating License (LO) expired in 2018, but the company continued operating until 2021 due to the automatic extension of the license (SEMAD, 2021a), a common situation in Minas Gerais as previously discussed. Following the license denial in 2021, and in order to continue operating without a valid license, the company signed a Conduct Adjustment Agreement (TAC) in 2021, committing to comply with 22 environmental conditions, including monitoring and installation of environmental control equipment, effective from 05/04/2021 to 04/04/2022 (SEMAD, 2021c). In 2022, having failed to comply with the TAC, the company requested its renewal and the transfer of ownership to ACTECH, resulting in a new commitment with 28 conditions, most of them replicated from the previous TAC (SEMAD, 2022a). In September 2022, SEMAD issued an Evaluation Report on compliance with the 2021/2022 TAC (SEI Process No. 1370.01.0009795/2021-33), which indicated the persistence of irregularities but did not oppose signing a second TAC, considering the economic and social relevance of the company (SEMAD, 2022e).

The report issued by the environmental agency recorded that nearby communities (Vila Operária, Saramenha, and Vila dos Engenheiros) reported persistent atmospheric pollution problems, with Vila Operária being the most affected due to particulate emissions. Although the company carried out monitoring activities, many were considered untimely or submitted with missing parameters. SEMAD indicated that future evaluations should propose improvements to the emission control systems (SEMAD, 2022e).

Despite full or partial noncompliance with obligations established in the 2021 TAC, no administrative sanctions were applied, according to the Sisema Transparency Portal (SEMAD, 2022d). One of the main problems identified was the absence of a formal environmental license application, which was required within 300 days but was not submitted. Instead of applying penalties, the state of Minas Gerais granted the company an additional 365 days to formalize its request and continue operating without an environmental license.

The second TAC was signed on 12 September 2022, with validity un-

til 11 September 2023 (SEMAD, 2022a). After it expired on 12 September 2023, it was extended pending the agency's decision, since the company had requested the extension before the deadline (SEMAD, 2023b), and SEMAD declared that the agreement would remain valid until a formal decision was issued, as recorded in Official Letter SEMAD/SUPPRI/DCP No. 22/2023 (SEMAD, 2023c). By February 2025, when this article was written, the environmental agency had not yet issued an official position regarding the possibility of extending the TAC or the corrective environmental licensing request.

As shown in Table 4, the environmental irregularities associated with the project are persistent, despite the licensing authority's full awareness of them. Between the license denial on 26 February 2021 and the end of this research in January 2025, ACTECH operated without a valid environmental license and without proof of environmental compliance.

Although at least two of the administrative irregularities identified in this case study constitute environmental crimes under Law No. 9,605/1998 – specifically Articles 60 and 68 (*Lei n° 9.605*, 1998) – no environmental judicial proceedings were found in the Ouro Preto district court involving ACTECH or its predecessor.

3.3. Causes and reasons for the persistence of irregularities

Overall, the analyses showed that weak environmental performance and noncompliance with legal requirements in the post-licensing phase are the rule rather than the exception in the processes reviewed. Moreover, the findings suggest that the licensing authority does not view these irregularities as grounds for suspending operations, even when the environmental license has been denied or when a TAC is not fulfilled in a timely manner.

The possible causes for the persistence of irregularities may be related to various factors. The following sections discuss those that clearly emerged from the interviews conducted in this study: institutional deficiencies; late or absent application of administrative sanctions; discretionary or inappropriate use of TACs; disorganization and lack of transparency in environmental actions; lack of regular action by oversight bodies; and a tacit culture of prioritizing economic development at the expense of environmental issues.

3.3.1. Weak institutional capacity and political bias

Several studies have already indicated that the institutional capacity of licensing agencies negatively affects environmental licensing (Duarte et al., 2017). This, combined with the lack of civil service examinations to hire staff, contributes to demotivation and human resource shortages, undermining the effectiveness of environmental agency actions. Such shortcomings compromise the assessment of environmental impacts and prevent

Table 4 Timeline of events and procedural steps in the environmental licensing process of the case study, evidencing the persistent non-resolution of irregularities.

Date	Occurrence	Description/Details	Source/Reference
23/05/2018	Request for renewal of the operating license	Application submitted by Hindalco do Brasil Indústria e Comércio de Alumina Ltda.	PU Case File 1370.01.0009795/2021-33
24/09/2018	Operating license expired	Operation continued under automatic renewal	PU Case File No. 1370.01.0009795/2021-33
26/02/2021	State denied license renewal	Reason for denial: Ineffectiveness of the control measures adopted by the project to mitigate environmental impacts caused by its operations; absence of environmental performance required for license renewal due to unmet conditions, as stated in the technical report	PU Case File 1370.01.0009795/2021-33; SIAM Case File: 16366/2013/005/2018
05/04/2021 to 04/04/2022	State executed a TAC (Conduct Adjustment Agreement) with a 12-month term	22 conditions established – with 03 unmet and 01 partially unmet. No sanctions were issued for non-compliance	TAC executed between SEMAD and Hindalco do Brasil Indústria e Comércio de Alumina Ltda.
06/03/2022	Company requested extension of TAC deadline	Formalization of a corrective licensing process not completed. A new deadline was set and a new TAC was executed on 12/09/2022	Case File No. 1370.01.0009795/2021-33
12/09/2022 to 11/09/2023	State executed a new TAC with a 12-month term	28 conditions established; no compliance assessment report available	TAC executed between ACTECH and SEMAD
14/08/2023	Company requested extension of TAC deadline	Request submitted by ACTECH	Case File No. 1370.01.0009795/2021-33
04/09/2023	Protocol of request for Corrective Operating License (LOC)	In progress	SLA Transparency Portal
19/09/2023	TAC automatically extended until a decision is issued regarding the extension request	Procedural Control Directorate issued an opinion favoring automatic extension	Official Letter Semad/Suppri/DCP No. 22/2023
18/04/2024	Request to suspend LOC process to submit documents	The company does not have the municipal compliance certificate from Ouro Preto. The process is awaiting additional information requested by the environmental authority	SLA No. 2073/2023

the adoption of corrective policies based on real data. These issues are corroborated by one interviewee's testimony:

> There are several factors. Today the environmental system does not have people capable of thinking; it is fully oriented toward serving the interests of developers. Management has no focus on monitoring. (...). The problem is management – there is no technical perspective, it is a completely political one. (...) If there is no monitoring, we don't know what is happening; monitoring is the foundation to confirm whether the policies being adopted are working or not. Since everything is going wrong, no one wants to monitor because, in the end, they would have to admit everything is wrong (GovEa).

Additionally, two interviewees (Comu 1 and Comu 2) stated that there is governmental neglect reflected in either a lack of inspections or their weakness. This situation was also clearly identified in the analysis of the 232 processes.

3.3.2. Late or absent application of administrative sanctions

There is also a failure in the timely application of sanctions or, in some cases, an absence of penalties altogether. In some instances, penalties imposed are mild and insufficient to ensure compliance with regulations, being perceived as a way to benefit violators, as highlighted in an interview:

> [...] everything is done so companies do not stop operating. It is desirable to be fined – just don't shut me down.... The rules involving sanctions were designed to ensure companies can continue operating, even when they fail to meet environmental performance requirements (GovEa).

Furthermore, the environmental agency often fails to collect fines or debts resulting from environmental infractions, and the statute of limitations on fines due to administrative inaction contributes to an environment of impunity, a situation also identified in the literature (Garcia & Fonseca, 2018). The "intercurrent prescription" of environmental fines occurs due to delays in administrative proceedings, which results in the loss of the State's right to pursue judicial enforcement. All of this is aggravated by the absence of judicial actions to prosecute environmental crimes and repair environmental damage, with administrative proceedings often stagnating for years.

This lack of State action is also linked to the previously mentioned shortage of human resources and was raised by three interviewees (GovEa 1, 2, and 3) and by Braga (2021) as one of the reasons for the State's delay in taking measures to penalize environmental irregularities, which ultimately benefits developers.

3.3.3. Non-rigorous use of TACs

The excessive use of Conduct Adjustment Agreements (TACs) has also been criticized, as these agreements end up replacing formal environmental licensing and weakening the rigor of the process, as reported by interviewees Comu, MinP, and LegMu, who also noted that their use may have a political bias, as stated in the following interview:

> *A well-designed TAC would be a good instrument; the problem is when it takes the place of an environmental license. People do not have the authority to say no. There is no strength to say no (...). TAC regulations are not followed either; there are technical notes that are disregarded and are mere formalities to keep the TAC alive. We are in a very complex situation in terms of solutions because there is a larger issue at play – there are qualified people who could technically define the procedures, but I do not see solutions due to political dynamics (GovEa).*

As the ACTECH case study demonstrates, the TAC appears to be used as a substitute for the formal environmental licensing process, incentivizing developers not to obtain prior licensing, since there is no regulation establishing transparent and objective rules for its formalization or penalties for noncompliance.

3.3.4. Disorganization and lack of transparency in environmental actions

Environmental license management is hindered by the lack of integration and organization of information across government systems, requiring the use of multiple platforms and still failing to ensure complete access to necessary data. Difficulties in monitoring environmental licenses and associated obligations were highlighted by two interviewees (Comu, MinP). To assess an project and obtain information about it, one must access at least five different systems – and even then, not all environmental information is available. Furthermore, even if there were institutional efforts to improve information management, the interviewee argued:

> The issue is deeper. (...). Those appointed to commissioned positions are placed there by politicians – that is the core problem. Talking about monitoring with someone whose appointment was influenced by the company being monitored means monitoring will not occur. Even if we had an effective system, companies would not be monitored. This model of governance is unsuitable. (...). It is run by people without the minimum necessary qualifications. More than ten years without hiring staff, people discouraged and leaving the institution. We lack the basics; even if we had the technical solution, it would not work (GovEa).

Additionally, the public is not properly informed about all actions taken by environmental authorities, generating a sense of opacity and lack of oversight, as reported by interviewees (GovMu, LegMu, Comu, MinP). Furthermore, most interviewees (MinP, Comu, LegMu, GovMu) were unaware that the company selected for the case study had been operating without a license. Their comments are consistent with findings by Jose & Silva (2020), which highlight the importance of making self-monitoring data – part of licensing processes and legally public – accessible to the population, which is rarely the case.

3.3.5. Lack of regular action by oversight bodies

Another issue raised by one interviewee (GovEa) concerns the lack of regular oversight of environmental agencies by external control bodies. This absence of oversight – by institutions such as the State Court of Accounts and the State Public Prosecutor's Office – contributes to the persistence of irregularities committed by the environmental authority, including omission, delays in monitoring granted licenses, and an apparent tolerance by the state of Minas Gerais toward environmental violations, as described:

> [...] we talk a lot about the executive branch, but we must recognize a broader scenario – there is no oversight (...). We are talking about other branches of government to seek broader solutions when the issues run deep, such as oversight by the Public Prosecutor's Office, the Judiciary, internal affairs bodies, the comptroller's office, and audit institutions (GovEa).

These irregularities illustrate a systemic failure in environmental management and in complying with licensing and enforcement norms, negatively affecting environmental protection in the state of Minas Gerais.

4. Conclusions and Final Considerations

Environmental licensing is an environmental policy instrument created to protect natural resources and community wellbeing. However, in Minas Gerais, its implementation appears to have deviated from its original purpose, presenting serious problems due to the failure to comply with the rules established for its execution. In order to understand the barriers to the observance of these rules, this study sought to identify and understand the occurrences and causes of legal noncompliance and poor environmental performance among licensed projects in the state of Minas Gerais. The research was based on the analysis of 232 cases of companies that renewed their environmental licenses, along with an in-depth case study of a metallurgical company in Ouro Preto (MG) whose license was denied. Methodologically, the study employed content analysis of documents and 12 semi-structured interviews.

The results suggest that the state government has insufficient human resources for the inspection, control, and monitoring of projects operating in the state. Moreover, questionable actions, such as allowing projects to operate without a proper license or with a denied license contribute to maintaining or postponing irregularities in projects with environmental problems.

The recurring practice of extending deadlines for compliance with legal obligations, which should be met before the start of operations, is also a critical issue, especially given the absence of clear criteria for such extensions. Environmental legislation, in turn, is vague and does not define clear criteria for renewing or not renewing licenses with pending or illegal environmental issues, which exacerbates the situation. The State's omission in applying the law and the tardy actions of competent authorities, coupled with the lack of oversight by external control bodies, were also identified as important causes of these problems.

In this context, the study indicates that significant improvements are needed in the State of Minas Gerais' oversight of environmental licensing. Revising the legislation that regulates the control of environmental licenses would be an essential step toward establishing the legal nature of

post-licensing activities and defining clear criteria to address irregularities in license renewals. Furthermore, the creation of regulations governing conduct adjustment agreements (TACs) is necessary to establish rules and limits that ensure these agreements are not used as mechanisms to postpone the regularization of projects.

Obviously, without institutional capacity – in the form of human resources, information systems, management infrastructure, and inspection capabilities – the State will continue to act untimely, without being able to clearly influence the environmental behavior of developers. It is also necessary to improve the treatment of trade-offs in the analysis of environmental performance. In the case study, especially in the interviews, it became clear that the State seems to lack the "courage" to suspend irregular activities due to an assumed socioeconomic benefit for the local population. However, this situation is neither addressed technically nor transparently; it is merely an assumption emerging from analyses of the persistent and acute irregularities at the project. Cost–benefit and trade-off analyses should therefore be conducted transparently and rigorously.

Addressing the problems identified in the study requires a multifaceted approach, involving improvements in the internal management of the environmental agency, stricter enforcement of sanctions, greater transparency of information, and the development of a more responsible and integrated environmental licensing culture. Additionally, the joint action of various actors – such as government, civil society, and companies – is essential to ensure that environmental irregularities are not only diagnosed but also effectively resolved.

Finally, from an academic standpoint, this study provides one of the most extensive analyses ever conducted in Brazil on the level of environmental irregularities in the post-licensing phase, offering empirical support for ongoing discussions about the effectiveness of environmental licensing and impact assessment. It is expected that, in light of the results presented here, new studies will be conducted on ways to improve the factors that could explain these irregularities, such as lack of regulatory clarity and specificity, weak institutional capacity, ineffective enforcement, and the absence of technical trade-off analysis.

Acknowledgements

The research was supported by CNPq [grant number 311990/2021-5] as well as by FAPEMIG [grant number PPM-00722-18].

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